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ORIGINAL COMMUNICATIONS:

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ORIGINAL COMMUNICATIONS.

THE CHEMICAL COMPOSITION OF DECAYED DENTINE.

BY CHARLES MAYR, A. M., SPRINGFIELD, MASS.

Some four years ago, though an outsider, I commenced to study more carefully the chemical facts connected with dentistry, and was first of all struck by the absence of sure data on which to base conclusions. The majority of the dental gentlemen I came in contact with had a pretty good idea of the histology and microscopy of the teeth, and an excellent one about the practical points in mechanical dentistry. But in spite of the fact that quite a number of eminent practitioners are at the same time excellent chemists, I missed exact statements as to certain points without which statements theoretical dentistry always would be but imperfect. I could explain to myself this apparent lack in no other way than by the fact that the most educated practitioners are those who are most busy, and find the least time for theoretical work, while those who have time do not have thc necessary apparatus or training. Especially painful became this lack of reliable data when the question of decay came up and discussing it, we were all in complete ignorance. I heard the best of them talk about solution of lime-salts, etc., but being relatively familiar with the action of acids on lime-salts, from the very first moment I began to study carefully, it seemed to me improbable that such a com-

plicated process like a decay, should be the action of a simple acid, the result of which I knew relatively well. So, from the very first, I was forced to combat the crude acid theory, which regarded a tooth like a block of marble, and felt somewhat inclined to the consideration of decay as a purely pathological process, comparable to chronic ulcers in other parts of our body. While this theory, as chiefly advocated by that eminent school of dentists at New York, excellently accounts for many symptoms of decay, and therefore claims a great deal of our full consideration, the chemical process of decay I could not imagine as being produced by the simple pathological changes in protoplasma, connective tissue, and lime-salts of the tooth as the consequence of the action of an acid. But I felt the nebulosity in which we moved when attempting to explain decay, from the simple fact that we were not acquainted with any exact results of analyses and experiments concerning the decayed mass as compared with sound dentine. Thus stimulated, I tried to fill out the gap I found—if successful, the reader himself may judge.

Let us never confound two things: the *structure* of a tooth and the *chemical nature* of a tooth. The first will mainly be governed by physical laws, while the second is governed by chemical laws, or at least less grossly mechanical laws. If we take the same quantity of a phosphate of lime, of carbonate of lime, of fluoride of lime, of magnesia, of connective tissue, of protoplasma and water, and rub them together in a mortar, and knead a tooth of them, we will have exactly the same substance as in a tooth, but while this tooth may behave chemically very similar to a tooth in the mouth, mechanically and physically there is no resemblance between the two. It seems to the writer one of the mistakes of some students in this line that they overlooked the importance of the connection of structure and chemical nature together. We cannot lose sight of either for a moment, but we had better discuss these questions after we have given results as a basis.

During the months of August and September, 1882, I made a series of very careful experiments in the line of analyzing decayed dentine. Probably very few are aware of the great labor involved in such work; not only is the quantity of material that can be obtained very small, it also has to be selected with great discrimination, and the results have to be carefully sifted. Many results had to be thrown out entirely, because evident errors had crept in from the presence of old fillings in a decayed mass (as proved by the presence of zinc in the residue), or from slight inaccuracies of weighing, etc.

But, even throwing out every experiment which might be considered doubtful, the remaining ones are so that they do not admit of any fair doubt.

Some things about the necessary requirements for such experiments. What to the histologist the microscope, that is to a chemist a fine and delicate balance, and as the value of a microscopist depends in a large degree upon the power of his instrument, so the value of a chemist in a great measure depends on his chemical balance. The balance in our laboratory easily and unmistakably could be adjusted to $\frac{1}{20}$ milligram ($\frac{1}{1200}$ of a grain), and during these experiments we had to work with this nice adjustment, necessitating very slow and tedious work. One weighing sometimes took one and two hours and more. As the quantity of decay of uniform structure—not of a composite mass, very often was less than $\frac{1}{30}$ of a grain, an error of $\frac{1}{10}$ of a milligram considerably influenced the result. The losses were always determined without removing the first weights from the weight pan, but only removing the difference, so that no objection could be raised against accidental errors, e. g., if a decayed mass on the platinum lid of a crucible, together with the lid of 2801.05 milligrams weighed 2802.15 milligrams, and it was found after ignition that the residue still weighed 2801.70 milligrams, and the lid after the removal of the little lime residue weighed 2801.05 milligrams as before, there was no mistake possible, the result was simply :

Weight of lid + decayed mass,	2802.15
" " alone,	2801.05
Weight of decayed mass to be analyzed,	1.10 mgrs.
Weight, after ignition, of lime-salts and lid,	2801.70
" of lid,	2801.05
" of lime-salts,	.65 mgrs.

Hence 1.10 milligrams decayed mass gave .65 milligrams lime-salts, or 59 per cent., etc. If we wish to determine how much lime-salts or organic substance have been lost, we must determine the amount of water in the decayed masses, not only in sound dentine. This was not possible in all cases, but I tried to determine it in a few. I made the following investigations :

First. Does the decayed mass contain any compounds of lime-salts and organic acids? (The question of free organic acids being left out because it could not be entertained for one moment.)

Second. How much water is in decayed masses compared with a healthy tooth?

Third. How much lime-salts and organic matter are left?

To answer the first question, I scraped out the decay of many teeth, and treated them with pure water. There is no ordinary organic acid—except oxalic acid—whose lime-salt is not somewhat soluble in water; acetate and lactate of lime are even easily soluble. I tested in many ways in this direction, and with but very few exceptions the results were negative; there was in the decayed mass no acetate or lactate. I will not forget to mention that generally I excluded the outermost layer as not being a fair test for what we want to investigate. What is of interest is not the outside mass of decay, and we will learn but little from it as to the starting of decay, but the inner layers more remote from the direct daily contact with food. The experiments of this kind all pointed uniformly to the absence of organic acid compounds in the inner layer. (If a decayed mass was say three millimeters deep, I did not take for experiment in this case the first two millimeters.) About half a dozen of these experiments were made very carefully, thinking that a relatively small number carefully executed is worth more than a thousand, carelessly done. Great truths in chemistry have not been ascertained by the quantity of work, but by the quality, and, to compare small things with large ones, when Liebig found the organic formulæ by his experiments in the determination of the composition of organic substances, one analysis was generally worth far more than the hundreds of experiments of earlier investigators.

Secondly. How much water is in a decayed mass? To determine this, the decayed masses were dried for about six hours, at 105° C. (221° F.), and their weight ascertained at intervals; after this time the weight generally remained constant, and did not diminish any more.

Thirdly. The percentage of organic and inorganic substance in decay was ascertained by igniting the small dried mass on a platinum lid, first in common air, and then in a gentle stream of oxygen until it was perfectly white. To convert back any caustic lime that might have been formed, the white mass was evaporated repeatedly with carbonate of ammonia, until the weight remained constant. By this method, the lime-salts were obtained in the same form in which they were in the tooth as phosphates and carbonates. It was then carefull weighed and the results calculated.

Results to No. 1. No acids or soluble lime-salts are in the innermost decayed mass; hence no acetic, tartaric or lactic acid had dis-

solved much of the lime-salts, because the acetates, lactates, etc., would not have been washed out completely from the decayed mass, but a small amount would still remain which, being soluble, would be easily shown by oxalate of ammonia acid.

Results to Nos. 2 and 3. One large decay was sliced up into several parts, and the slices analyzed according to the above plan.

First slice—Outermost, very gelatinous soft layer.

Water, 58 per cent.; organic, 26 per cent.; lime-salts, 16 per ct.

Or, omitting the water, organic, 61 per cent.; inorganic, 39 per ct.

Second slice—Middle, water not determined because no longer reliable. (The specimen had become a little dry.)

Organic, 55.8 per cent.

Inorganic lime-salts, 44.2 per cent.

Third slice—Innermost, white friable mass just close to the healthy dentine, scraped out with a soft iron wire, and very crumbling.

Organic, 32.1 per cent.

Lime-salts, 67.9 "

This decay which was analyzed in these slices shows therefore from the outside a uniform approaching to the normal composition of the tooth. It shows that the lime-salts are removed, but not in any way which the acid theory demands. The removal is secondary, and the simple consequence of the action of the liquids of the mouth, which act more on the outermost layers, and gradually less and less, until at the border line no action of the acids is perceptible, while the structure is completely broken down. While therefore the secondary process of disintegration of the decayed mass is plainly referable to the action of the liquids of the mouth, the action at the innermost layers is not in accordance with what we know about the action of acids. While the chemical composition of the innermost layer is almost (and as was seen in some cases completely) identical with that of healthy teeth, the structure is totally different. The tooth is disorganized, the soft friable white decay is no longer organized, though chemically only slightly differing from the tooth substance. Several other experiments were made, but none as consistent as the one cited above. One black decay showed in the total 49 per cent. lime-salts, and the innermost layer 72 per cent.; another sample of decay as a whole gave 56 per cent. lime-salts. The experiments are not yet concluded, but are still going on. The lowest amount of lime-salts was met with in the case cited, 39 per cent. As the experiments are not of equal nature in

exactness, it would not be fair to make a general average of them, but the results given are sufficient to establish the facts already mentioned formerly. In one case only did I attempt to determine the proportion of phosphates in decay, and to compare them with the healthy tooth, but the quantity of substance experimented on proved too small, and the result was unreliable. The carbonates are of course greatly diminished in the outer portion of decay, but the innermost white layer still contains them, similar to normal dentine. I shall endeavor in my future experiments to keep this point in consideration. I am afraid the patience of my readers has been wearied too long, and I shall not give them my opinion as to the cause of decay, because on these points others can do it better and more impartially.

ANNUAL ADDRESS,

Read before the Connecticut Valley Dental Society, October 26, 1882.

BY C. FONES, D. D. S., BRIDGEPORT, CONN.

In accordance with a custom of this Society, it is the duty of the retiring President to prepare and read an address, and in complying with this custom, I do not intend to occupy much of your valuable time. The honor conferred upon me is appreciated. This Society is noted for harmony, good feeling and its earnest desire for the truth. Ever since my connection with this organization, I have noticed that the subjects which received the most attention in the discussions were receiving attention from the best men in the profession all over this country, and I have no doubt that each one of us have returned to our several places of business, renewed in mind and body, determined to make closer observations and, if possible, do better work.

In the past, this Society has had to depend upon the executive committee for papers and other material for its meetings, and it was difficult to get papers on the various subjects that would be of interest to the members and call out a lively discussion. Last year the Society divided itself into five sections. Each section has a chairman, whose duty it is to make a report at each of our meetings.

Last June we held our first meeting, at Amherst, under the new order of things, and, despite some little failure on the part of some of the machinery to do its full part of the work, we had a very interesting meeting.

The chairmen of four of the sections had reports, which furnished first-class material for discussion during the session. The indications

are that the plan will be conducive to the advancement of the Society. . . . .

We have all heard a great deal about manipulation, the best method, the different materials, appliances, etc. These are all right, and if we would succeed they must be looked after closely; but they should not receive our exclusive attention. Up to within a few years, very little has been said in our societies about the general system, anatomy, physiology or histology; but now (thanks to a few noble men) we understand that a tooth is a live organ, permeated by the reticulum of Heitzmann, or a net of living matter. This being the case, does it not follow that the varied conditions which affect the general system will affect the teeth? Just how nutrition is carried on in a tooth, I have never been able to ascertain; but that there is a circulation of nutrient material in a tooth I have not the least doubt. I have for years noticed the effect of the general health on the teeth, and in nearly every case where there has been a long and severe strain on the nervous system, rapid decay of the teeth is sure to follow. Especially is this the case in young patients. The general health may be fair, but the nerve centers are weakened by overtaxing their capacity to such an extent as to seriously interfere with nutrition.

It may be that the law of heredity has much to do with this condition, so that the teeth may or may not be well formed. The patient having inherited a nervous system, incapable of standing a severe strain, is so weakened as to be unable to properly perform the function of nutrition in the teeth, thereby leaving them an easy prey to the forces outside of the teeth.

I would liken the tooth to a fort which is well built, supplied and mounted, and successfully resists every attack of the outside forces, until the men are stricken with some contagious disease, the supplies are exhausted or cut off, so that the forces within become weak and emaciated; then the forces outside attack the fort in its weakest place, and finding little or no resistance, are able to break it down.

I will read an extract from a paper which I read before this Society some four or five years ago, and the observations that I have made since that time have only strengthened the convictions I had then:

"One of our greatest medical philosophers (Prof. Jackson of Phila.) deplores the marked tendency of the physical organization of women on this continent to degenerate. Is it not reasonable to suppose that this weakening of the physical forces of the mothers of this country (thereby reducing the organic forces) has more to do with

the congenital anomalies, so often seen in the teeth, than the lack of a sufficient quantity of the lime element in the blood? Are not the fissures, pigment spots, and other abortive conditions we see in these dentures, caused by a lack of nervous energy to properly sustain the organic forces in their effort to make a perfect denture?

I am led to believe that the cause of these defective teeth is a weakening or letting down of the vital forces, thereby preventing the proper assimilation and organization of the inorganic substances." This condition may be brought about in many ways, some of which I will mention.

In cases where young persons are stimulated to great effort in their studies by contesting for a prize, the post of honor, cramming for an examination, or loaded down with too many studies. They may be over-worked physically, too vigorous exercise, excess of all kinds, boys who work hard all day, and drink, smoke, and stay out late nights; those who are taken from out-door pursuits and shut up in shops and stores from twelve to fifteen hours per day; young misses who at the age of puberty have responsibilities doubled—these and many other things that might be mentioned, in my opinion, debilitate the nervous energies to such an extent that nutrition is impaired. Each one who passes through this ordeal will receive the imprint according to the power of resistance that there is in the constitution of the person, more or less. Consequently the effect of such nervous strain would not be the same on the teeth of every person, but the expression of the injury upon the teeth would be in accordance with the power of resistance in the individual.

This, it seems to me, accounts for the fact that a person's teeth will decay with great rapidity at one time of life, while at another they will be strong and healthy—the latter condition depending upon the recuperation of the nervous energies and a consequent assimilation of the nutritive element by the teeth.

If the power of resistance is weak, decayed teeth should be filled with some low conductor until the nervous system has become more vigorous and the teeth are healthy and harder. I am not sure that this hardening is the result of a greater assimilation of the lime element in the teeth. It seems to me to be more the result of the return to health of the basis-substance. It has occurred to me that if nutrition were interrupted in a tooth, the basis substance might become emaciated the same as in case of a similar substance in any other part of the body. I have seen cases where the teeth were

badly decayed, and in the course of a year or two the progress of decay was arrested, the cavity seeming to be lined with a brown cartilaginous substance which seemed to be quite free from lime; and in every case when this condition appeared, the person was enjoying unusual good health.

Now the dentist of to-day should be one who is able to "*take in*" all of these conditions, and diagnose each case correctly. The office of the dentist is not simply to fill teeth, not a mere manipulator of materials, but to care for the teeth; and to properly perform this duty, he must be a close observer and have good judgment. There are certain pathological conditions of the teeth which must be understood before they can be treated and filled intelligently. Disease has an expression as well as health, and one must be able to recognize the kind and extent of the disease in order to treat it successfully.

To say that all teeth should be filled with any one material exclusively would be like the physician who would treat all of the diseases to which the human system is heir, with one kind of medicine; and this indicates a want of diagnostic ability and looks as though he were riding a hobby. Good judgment, with a conscientious desire to do the very best that can be done, I consider one of the most desirable acquisitions the dentist can possess. While I place a high estimate upon the ability to make fine operations on the teeth, I cannot but feel that great injury has often been inflicted, both upon the system and the teeth of patients, by a lack of judgment. One should have a thorough understanding of all the laws that govern the system, should be a close observer, and keep a true record of each case, so that a comparison can be made at any time and the difference noted. When this is faithfully done, it is one of the best educators for the dentist and lays a broad foundation for good judgment.

CRITICISING A CRITIC.

BY DR. CHAS. R. E. KOCH, CHICAGO, ILL.

In reading Dr. Davenport's article on the "Bioplasson Theory and its Critics," in the December number of the New England Journal, my attention was particularly fastened to a matter really foreign to the question in controversy, but to which all of page 389 is dedicated. The ardor with which Dr. Davenport defends not only the theories and discoveries, but also the character of Dr. Heitzmann, would have been, it seems, sufficient advocacy of them without recourse to an

attempt to cast ridicule and contempt upon Dr. Curtis—who is, later on in the article, admitted to be an "earnest searcher" after the truth—as such an attempt is illy calculated to advance the progress of science. I have not the honor of a personal acquaintance with either Dr. Heitzmann, Dr. Davenport, or Dr. Curtis, and (perhaps I ought not to admit it) I am not competent to take up sides on the main question at issue; but I desire to submit that combating an antagonist with the shafts of ridicule, while it may afford amusement to the vulgar crowd in the arena, is sophistry of the very poorest kind, and can never bewilder or obscure the minds of men capable of discerning and distinguishing the truth, who are really the ones to sit in judgment. When Dr. Davenport calls attention to the fact that Dr. Curtis resides in Chicago, and to certain "phrenological testimony" (?) with reference to people who reside in this backwoods-corner-of-the-world, he evidently counts on the applause of his audience to be produced by this *hit*, as a score for his side of the question. His allusion to the "freshness" of the Western breezes is of course a *clincher*. The testimony of Dr. Curtis stands incontestably impeached. Does not he reside in Chicago? and is not this proof positive of his incredibility? If this is not sufficient to carry conviction, here is the additional fact that he lives under the influence of the "Western breezes," and that settles it beyond a doubt! He must be wrong in antagonizing Dr. Heitzmann; and Dr. Heitzmann and Dr. Davenport must hence be the true prophets. If our Eastern brethren, while endeavoring to decipher the secrets of the structure of the blood corpuscles, are aided in their groping by the illumination such *funny* allusions afford, I do not know as we of the West should object, although it would seem that scientific gentlemen, in criticising each other, should not use the weapons of vulgar plebeians, but treat each other in a spirit of fairness, gentlemanly and scientifically. Nearly a quarter of a century's search for better light, spent under these disadvantageous "fresh" Western breezes, has failed to teach me that ridicule or vituperation has ever carried conviction to inquiring minds. Truth is mighty, and it will prevail, irrespective of who utters it or where it is uttered. I plead for the abandonment of this method of personal attack in scientific disputation. Let the exponents of different views conquer or convince each other by such weapons as logical deductions and demonstrable facts will abundantly furnish. Such a course will elevate our professional periodical literature, and make our profession more respectable in the eyes of the pursuers of co-related sciences, and hence more influential; and it certainly is more in consonance with the spirit of civilization and christianity.

SELECTIONS.

BACTERIA THE CAUSE OF CARIES.

BY F. Y. CLARK, M. D., D. D. S., N. Y. CITY.

[Read before the American Dental Convention, August, 1882.]

There is much confusion and contradiction as to the cause of dental caries. It has ever been taught in our schools, books, and until very recently by nearly every practitioner of dentistry, to be of acid origin; but the facts gained from analysis and microscopical investigation, to say nothing of overwhelming circumstantial evidence, do not warrant this teaching or belief. Over fifteen years ago we asked, in an essay before the Southern States Dental Association, What is carious dentine? How does it differ from sound tooth structure? Is it the same when detached from as when connected with sound tooth structure? Will it, when taken from its bed and placed under a filling, act on the living the same as when allowed to remain partially connected with living structure? Why are we so particular in the removal of every mite before filling? You say because, if any is allowed to remain, in the course of time it will infect sound dentine, and necessitate refilling. Would a layer of sound dentine, or any less objectionable substance, do this? You answer no. What contagious agent, then, is there in this mite of decay, to produce this? How does the same agent produce all the different shades of decay—the black, the white, the yellow, and so on? We are told acetic fermentation and acids combining with the lime of the teeth form new agents; but what those agents are, or how they act on sound structure, we are not intelligently informed.

Our fermentations, as far as we have any understanding, are alcoholic, acetic, butric or lactic, ammoniacal and putrefactive. Fermentation is the converting of organic or inorganic matter into something else. There is no fermentation without an organism. It is through air germs that first ferment is introduced, and the organisms inaugurated by these first germs inaugurate a second, and so on, to putrefaction. It is through this law of succession of organic life that all vegetation is produced. Without it earth would be a rocky waste, with no vegetation or means of sustaining animal life. It is through air germs that the first ferment of which we have any knowledge is brought about, and to the organisms thus introduced investigation as

to the laws governing higher life must begin. Exclude air from any organic matter, and it will remain unacted on and unchanged indefinitely. This is seen in every day life, for there is no animal or vegetable matter about us that is not undergoing change through this law. Whenever any production of the vegetable kingdom, from want of suitable sustenance, or the conditions necessary to a healthy development, becomes wanting or deficient, it is quickly attacked by fungi, or organisms which increase in many instances so rapidly as to destroy adjacent healthy growths. This is sometimes the source of great loss and annoyance to agriculturists, as frequently whole fields are destroyed. Now the same thing occurs in the animal kingdom when there is a want of bioplasm necessary for the building up of a member of any organism. In this bioplasm is cell matter that constitutes enamel, dentine, vein, artery, and every tissue of life, and when wanting or interrupted, no matter how caused, ferment through air germs follows, and thus are inaugurated and brought to view by the microscope the smallest living organisms called bacteria. When through the microscope we see for the first time these myriads of living, moving organisms, apparently endowed with some kind of intelligence and movement power, which enables them to swim about, turn, twist, go backward and forward, not more than $\frac{1}{3000}$ of an inch in diameter, all occupying a space not larger than the point of a needle, and are told they are nothing but plants intimately related to larger ones familiar to common vision, no wonder the mind is held in doubt, and is half inclined to disbelieve one of its own senses. But farther examination opens up a new world of investigation. We study a few works, spend a few months with the microscope, and think with Darwin and many others that evolution is a fact; that some one of these infinitesimal specks is certainly within the reach of man's production; but when we get farther on in the paths of Pasteur, Huxley, Tyndall, Cohn and Beal, and become somewhat familiar with some of their experiments, we are obliged to own that the misty veil of first life is still unrent. If air germs, as some say, come through dust from some other planet, we may ask, how come they in this dust. So, with present powers of research, we must own, as Beal puts it, there is a beyond and beyond, which man cannot reach. Through these smallest of living things decay becomes, as the saying is, but another form of life. When all of man that is earthy ceases, countless lives are inaugurated, which in turn, through fermentation, give life to successors, and so on up the organic ladder until man is again living through the agency that

brought about his putrefaction, and thus life is a circle. At one time it was a mooted question to what kingdom bacteria belonged. Many investigators classed them with infusoria, and other low organisms of animal life, but now they are generally admitted to be plants. They differ in nearly all respects from infusoria. "They have," says Cohn, "no morphological distinction of ends, no flagellata, or movement organs, and live like the amœba by absorption—by extracting what is necessary for the propagation of their species from the substance in which they are found, organic or inorganic. They are of almost every conceivable shape—round, oval, twisted, straight, oblong, screw-shape, cylindrical, and many others. They live with or without air, and are found in all animal and vegetable matters undergoing fermentation. Sometimes they are very active, and this is lasting when seen in a jelly-like mass; and again, without apparent cause, they become motionless. Sweets and fermentation increase their activity." Through the protection of a cell membrane they are enabled to resist great extremes of heat and cold, some species much more than others. We have frequently seen spirellum volutans—the largest of all bacteria—converted into ice, and become quite lively when thawed out. They are propagated by cell division, or by the formation of new joints, and subsequent separation at these joints. In favorable and unmolested localities, when conditions are suitable, their increase is almost beyond conception. One or two will increase to millions within an hour. It is by budding, their species become mixed; as on an apple tree, by budding or grafting, we have several varieties of apples—sweet, tart, sour—all different in taste, shape and shade; although the wood and bark of tree and limb is the same, the fruit is different. Thus a contagious germ can spring from a harmless parent cell, just as the poison ivy can be budded on the harmless woodbine, or the poison bitter almond on the nutritious sweet. So, also, in the lowest order of plant life, owing to causes as yet not thoroughly understood, contagious germs can spring from harmless parent cells. All tissues, veins, arteries, bones, teeth, and every special part of the body, have particular special and individual cells, all acting in harmony, constructing, building up, repairing, throwing off and removing defective and useless parts. If a cell necessary for the perfect development of a tooth is destroyed, or in any way disturbed, the tooth on erupting will invariably show the disturbance by defective enamel pits, fissures or other marks. Owing to this, we frequently see whole sets, on erupting, defective. Thus we can readily understand how any organ can be-

come defective, diseased, or missing, if these bioplastic cells are in any way interrupted. It is owing to due respect to this law that certain teeth are sometimes wanting and found in remote parts. As stated, the chemical theory of decay is, that acids generated in the mouth act on tooth structure so as to cause its decay. But with the death of Liebig, and the advancement of microscopy, this chemical school, with its nascent and atomic theories, is fast passing away, and it would now be a bold scientist who should dare to deny the crucical evidence of Pasteur "that fermentation is a change of chemical composition in organic compounds brought about by a certain class of plants which, deprived of drawing the essential element of their composition from the air, *propagate themselves in the very substance of organic matters of all kinds by the breaking up of these matters and appropriating such elements as are necessary to their own growth.* Organic matter cannot of itself bring about inorganic matter, no more than inorganic can bring about organic. This in microscopy is an accepted fact, as sterilized fluids will remain so for ages if kept free of external matter, but when exposed to air, if pabulum be added, ferment follows ferment until that of putrefication sets in, and with putrefication comes bacteria termo, an organism ever present where and when putrefaction is going on. Although bacteria termo is seen with other species, it is accepted as the true organism of putrefaction, and no putrefaction can take place without the assistance of this germ. Bacteria termo, which has somewhat to do with our inquiry, has been generally plated and noticed, but until recently its true ferment has been little understood. "If a piece of meat is placed in a glass of water after other ferments have passed and putrefication set in, a cloud will be seen surrounding the meat, and will increase and continue active as long as there is anything to putrefy—this cloud is bacteria termo. Towards the last the cloudy sediment changes color and becomes very offensive, so much so that it is painful to examine." As before stated, when the teeth are imperfectly formed, full of pits and uneven surfaces, owing to derangement of form cells—they are more easily acted on by external agents. These pits, fissures and roughened surfaces are, in many cases, inaccessible to the brush, and consequently become little laboratories for fermentation. If a mite of animal or vegetable food is left for a few days in or around the teeth, one ferment follows another, with organism after organism, until the tearing down process of putrefication or bacteria termo is in full force. One grain of vegetable or animal matter, with a few drops of

saliva placed in a glass, and kept at the normal temperature of the mouth, will generate within a few days millions of bacteria. The same thing goes on in the mouth whenever or wherever these organisms find pabulum and unmolested localities. This is a universally accepted fact with the belief of the majority, that the cause of decay is owing to acids in the saliva. After alcoholic fermentation, it is true we have acetic; but the acid of this ferment is so weak in the fluids of the mouth that it can scarcely be detected, and in very many mouths where the teeth are under rapid decay it or any other acid is not found at all. A tooth may be cut half away, and if smoothly polished it will never decay. If caries was the result of acetic acid in the saliva, would this be the case? Mycoderma aceti, the supposed ferment of vinegar, is not perfectly understood. Particles of food in pits and fissures of the teeth, where mycoderma aceti is found, has a slight yellow tint; following other organisms, such as the vibrio regula and spirochœte plicatilis, are seen; but so far as can be seen there is no perceptible action on the tooth structure until bacteria termo is present. As we said in a previous paper, it is impossible to account for or explain all the shades of carious dentine on the acid theory, for acids cannot by any law known to chemistry produce them. But on the other hand, by the pigment in the protoplasm of bacteria, all the shades seen can be produced. We don't wish to advocate the chewing of tobacco, for in the mouth it is a dirty weed, but every dentist of any experience and ordinary observation knows it has a tendency to stop decay, which no doubt is owing to the antiseptic agency of nicotine. The crown of a tooth, as you all know, is protected by a covering of enamel, which is very dense; under this covering there is what is known as dentine, which is more like bone full of tube cells, with mouths opening into the enamel. These cells, called canaliculi, are filled with nerve bioplasm, and, by measurement, are large enough for the easy entrance of many species of bacteria. Thus, from what we have said, those familiar with the laws of fermentation can begin to understand how this bioplasm—the life of the tooth—may be absorbed or converted into pabulum for destructive organisms. For, as already stated, when and wherever the enamel, through imperfect development or other cause, is thin, as under the pits or abraded surfaces, the mouths or tubes of the dentine, through fermentation, are easily entered by bacteria, which, as Pasteur and others assert, live at the expense of the organism in which they are found, by absorbing and appropriating the life matter for their own substance and the-

propagation of their species. We will now attempt to show a few of the organisms found in the saliva of the mouth and carious dentine. The microscope before you has a binocular and a one-sixteenth objective. Examine first on this slide No. 1 a drop taken from the sub-lingual duct of a gentleman present in whose mouth are several decayed teeth; you will find in this saliva no organism, at least none that the power used will bring to view. Now examine this slide No. 2, on which is the fraction of another drop from the same mouth, taken with a little mucus from the pit of a second superior molar. In this you see spherical organisms, which we will not attempt at present to name or class. They are of the micrococcus species, and are generally found in first ferments. On this slide, No. 3, we have a little saliva taken from my own mouth, which has been kept at normal temperature for nearly two days, and which is now in a state of fermentation. In this, you see, the organisms are larger, quite numerous, and active. They are slightly different in shape, but no doubt of the same species as seen on slide No. 2.

In this vial, No. 4, is carious dentine mucus and saliva, which has been kept at the temperature of the mouth for forty-eight hours. In this preparation you see spirochate plicatiles, vibrio regula and what we take to be bacteria termo. Allow this preparation to remain a few days longer, and it will become so putrid and offensive as to scent this whole hall, so that no organism but bacteria termo will live in it. You meet with patients now and then with the accumulation of weeks in and around their teeth, who never use a brush, whose breath is equally offensive; for where particles of decomposing food remain undisturbed, through fermentation, the same thing goes on. There are one or two other preparations of carious tooth structure that we would like you to examine, but fear time will not permit. Enough has been said and seen to create inquiry if not conviction as to organic decay. The time is fast approaching when thinking minds will not be satisfied with the *old egg shell theory* that teeth are nothing but lumps of lime, and that the acetic acid of the mouth decomposes them. This theory, ridiculous and untenable as it may seem, has misled and placed our profession in a wrong position for over an age, and by false practice caused the loss of many teeth. But when we see in letters and journals such passages as the following from such men as Dr. Spalding of St. Louis, and Stockwell, of Springfield, Mass., there is reason to look forward to better teaching and more intelligent practice. In the March number of the New England Journal, Dr. Spalding says:

"My first experiments were made upon the saliva of a young girl (aged 12), whose teeth were decaying rapidly, so much so that fillings previously inserted, that is, before the case came into my hands, whether of gold or other materials, had lasted but a short time, and in whose teeth new cavities were constantly forming, and this at so rapid a rate that cavities of considerable size would form in the space of a few months, notwithstanding pretty thorough cleanliness and good general care. I looked to find an acid reaction of the saliva in this case, and had been reflecting on a course of medical treatment, having in view this supposed condition of the saliva. What, then, was my surprise on finding, after repeated tests, that the saliva of this young person exhibited in every test either a neutral or a slightly alkaline chemical reaction. In no one of a large number of tests was there any, even the smallest, acid reaction shown. I immediately sought other cases where a similar destructive process was going on, but the result in each was precisely the same as the case just narrated."

Dr. C. T. Stockwell writes: "The more I look into this thing the more convinced I am that the present and former teachings on the subject of Etiology of dental decay are erroneous and superficial. That acids are *not* the exciting cause. In fact, that acids have very little to do with it. The ever present germ and bacterial life in all stages of development, together with a *weakened condition* of the nervous tissues, are the two necessary conditions of tooth decay. The laws and processes of *putrefaction* come in here as the '*sub*-structure' upon which we have to erect *our* '*super* structure.' Is this not so? This is a subject that will no longer down at a cold sneer or shrug of the shoulder. The profession have got to meet this question and prove it erroneous or accept it with all an acceptance implies."

In conclusion, then, in order to be correctly understood, *we repeat that acids are not the cause of carious tooth structure. The real cause is bacteria inaugurated by air germs through first ferment. All pits, fissures, abraded, hidden, and all inaccessible places in and around the teeth, where particles of food or foreign matters of any kind are lodged and unmolested, organism follows organism, absorbing the bioplasm in the canaliculi, leaving the limey substance to disintegrate. The change of shade is caused by the pigment in the protoplasm* of bacteria, which is light, yellow, brown or dark, according to organic advancement. In disinfecting carious structure before filling, where there is danger of pulp exposure, we have been in the habit of using carbolic acid, chloride of zinc, or chloride of mercury, and have

had the satisfaction in after years of seeing the good results of this practice, and in quite a number of cases positive recalcification. Dr. R. Koch's experiments on bacilla, show that chlorine bromine and mercuric chloride give the best results. Solutions of mercuric chloride nitrate or sulphate, diluted to one in 100, destroy spores in ten minutes in prepared solutions. Does not this solve the mystery of the old mercurial fillings inserted over forty years ago and explain the cause of black recalcification of dentine often seen under those fillings? Amalgam at that time, as you know, was composed of coin silver and mercury, and the men using it were considered quacks and made little or no attempt of removing decay or surplus mercury. Our modern amalgams though *very pure*, and which take so *very little mercury*, don't give the same results.—*Independent Practititioner.*

35 West Thirty-fifth street.

EDITORIAL.

At the meeting of the Massachusetts Dental Society, the subjects discussed were old, yet always interesting and practical.

The Treatment of Devitalized Teeth, by Dr. S. F. Whitton, of South Boston, was presented in a clear, methodical manner, without notes, but showing a thorough preparation. His position that devitalized teeth, whether recent or of long standing, need only the thorough cleansing and filling of the pulp cavity *as nearly as possible* to the apex, was supported by forty-five recent test cases, with only one failure. His method of cleansing and filling, the instruments, and material used, and a statement of the difficulties often encountered, were fully presented, and showed that he is thoroughly at home in that department of surgery. We hope to publish a paper from Dr. Whitton on this subject, as it is one of great practical importance to every dentist.

Prof. D. D. Smith, of Philadelphia, read a carefully prepared paper on Materials for Filling. He advocated the use of the combination of amalgam and gold in soft and medium soft teeth. In hard teeth, gold alone is the best material. The reason why he prefers amalgam and gold is found in the results of his own experience in the use of gold alone, of amalgam alone, and of their combination, in the classes

of teeth named. The theory by which he explains the results, is that the galvanic action of the metals (Palmer) prevents the re-appearance of caries. This paper is to be published in full.

Prof. Smith also gave a detailed description of his method of placing porcelain crowns on natural roots, which he thinks superior to the Bonwill crowns. His method in its general features is an old one —an ordinary gold plate tooth, a platinum plate covering the end of the root, and a platinum wire extending as far into the root as admissible, and retained by gutta-percha. The features of special interest, and belonging to Dr. Smith, are the cutting away of the labial portion of the end of the root so as to bend the plate under the margin of the gum, thus preventing rotation on the pivot, and a better union of the crown with the gum; also, the use of sufficient heat, in packing the gutta-percha and pressing the crown to place, to insure the oozing out of all surplus material, and admitting the plate perfectly to place. Every part of the operation requires perfect work, and, when perfectly done, he thinks is superior to any other method of pivoting.

The *Independent Practitioner* was always a very good monthly, and it had more special articles on dental subjects than any other miscellaneous journal, but it seems to us in an enviable position now, having secured Dr. W. C. Barrett, of Buffalo, as dental editor. We need say but little about Dr. Barrett; only men not yet known, need puffing. From all we know about him, we expect the Independent Practitioner, under his management, to become a most popular and thoroughly scientific monthly.

The Dental Department of the University of California had their commencement exercises November 8, 1882. The following were the graduates: Thomas Watson Hall, Charles Wesley Hibbard, Thomas Morffew, John Henry Plomteaux, Charles Wess Richards, William Harry Stanley, Gustave William Sichel, M. D., August Van Crombrugghe.

S. W. Dennis, M. D., D. D. S., is the Dean of the Dental Faculty.

The third annual banquet of the Chicago Dental Society was given at the Palmer House, December 13. We wished we could accept the invitation to be present, but distance was an obstacle.

We call the attention of the profession to several new advertisements in this number, and especially to that of Drs. Mack and King, Mechanical Dentists. The tendency of the present day is, fortunately for suffering humanity, away from such *base* materials as rubber and celluloid. There are, however, many dentists who, having come into the profession within the last ten or fifteen years, are unskilled, or have not the necessary apparatus or equipments for the better class of work that is being demanded, or at least that *special cases* demand, that may find it convenient to avail themselves of the skill and experience of those who make the mechanical department in all its branches a specialty. We have reason to believe that these gentlemen are reliable and in every way competent and trustworthy, and cheerfully recommend them to favorable notice. By corresponding with them, special instructions may be obtained.

From an article of Dr. Willoughby Miller, of Berlin, Germany, that appeared in the Deutschen Medicinischen Wochenschrift, No. 39, 1881, but which has not received due attention in this country, we give some extracts:

"I maintain that there exist electrical currents in the mouth, but not between the filling and the tooth-substance; they are only produced by the heterogeneity of the metallic fillings."

"The conductive power of dry dentine for the electric current was tested with pieces of .03 mm. (.0012 inches) in thickness, and, in spite of the fact that the well-known galvanometer of Prof. Du Bois Reymond was used, not the slightest passage of electricity could be noticed."

"When the dentine was moist, the moisture conducted the current, as was proved by testing in sections in the direction of the tubuli, and across them. In the first case the conductive power was five times greater than in the second. In the second case the current had to flow for the greater part through the small ramifications of the tubuli, while in the first case, it could travel through the tubuli without much resistance from the dentine."

The First Dental Society, of New York, has suffered a great loss in the death of Dr. William H. Allen. A committee has drawn up resolutions and a memorial appropriate to the loss. We are forced, from want of space, to put it over till next month.

Operating Table and Laboratory.

ABRASION.

In considering the abrasion of teeth, we recognize but two causes: the mechanical and the chemical. As to a possible physiological cause relating to certain forms of (so termed) chemical abrasion, we have as yet very little knowledge. We know nothing of nature's processes in repelling causes of waste and disease encroaching upon teeth, excepting that irritation and consequent inflammation cause mal-formed lime deposits under certain circumstances that may be measurably protective, producing a tissue more dense than the original product.

I wish to call attention to the claim made by some of our earnest thinkers, that were it not for the constant supply, even to the periphery of the enamel, of such material as will measurably repair the waste produced by the *ordinary* use of the teeth, these organs would in a very brief time be wasted away, this assertion being based upon the belief that the protoplasmic dentinal fibers are in a certain sense transporters of the needed material to the dentinal *basis*-substance—which is quite likely true in a *modified* form, though I fail to see *proof of any such theory* relating to the subject in hand; though we have ample proof of the various forms of secondary dentine *within* the walls of *formed dentine*. The idea that is carried out by this claim is that, by this low circulation, the *rapid* waste of the crown portion of all teeth was prevented. Why are not "dead" teeth dissolved in a few years? If it is owing to the supply *nearly* equalling the waste that prevents rapid destruction of—say the incisors, why is it that the substance possessing the lowest degree of circulation, the enamel, should resist the causes of waste more than the dentine? All dentists are familiar with the fact that mechanically abraded incisor teeth are concave on the worn surfaces, not convex. The dentine may be very brown and dense, but it has wasted *more rapidly* than the enamel. Now the query arises, is it more than mere mechanical resistance that prevents a more rapid waste? The slow waste of enamel resulting in exposure of dentine, the terminal portions of the fibrillæ therein first wasting away, the canaliculi imbibe such substances from without as stain and block up these tubuli. Whether the idea carried out by the query be true or not, it is quite certain that from observations of

abraded teeth and a knowledge of their minute anatomy, the theory of a preventive physiological process is quite untenable.

R.

This article on Abrasion is a kind of query, and as it contains ideas which can be grasped and examined, we thought it worthy of careful consideration. The querist considers lime deposits, which are more dense than the original tissue, "measurably protective." Against what? Against acids, inflammation, or an outer enemy.

The idea that supply must be given to the periphery of the enamel, to prevent its being wasted away in short time, is not based on "the belief," which is only an explanation of the idea, but on the fact that acetic acid (vinegar), malic acid (apples), citric acid (lemon drops), tartaric acid (grapes), butyric acid (sauer kraut), lactic acid (milk), etc., are continually eaten, that they inevitably will dissolve some lime-salts and that, if it were not for supply, the enamel would soon be dissolved. Let any one make the experiment: Rinse the mouth perfectly clean, take acetic acid (vinegar) free from lime-salts, about twenty drops to a spoonful of water, roll it once with your tongue over your teeth, spit it in a test tube and test with oxalate of ammonia, and you will find the presence of lime. Some time ago the writer made experiments with teeth and acetic acid, and found that one week's immersion in vinegar of average strength was sufficient to dissolve the enamel entirely. Similarly act other acids. If we suppose in the average a daily contact of teeth with an acid of only two minutes,—practically it may vary perhaps from 0 to 15 minutes,—in about fourteen years the action of acid alone would have destroyed the entire enamel, but nothing of that kind is observed; hence, the unavoidable conclusion of a supply. How the supply may be brought about is open to conjectures, etc.; but we cannot fairly doubt the necessity of a supply.

The writer speaks of "mal-formed" lime deposits. The term is one we cannot quite comprehend. All things in nature are formed equally by the same law, and as long time as we have no standard how lime deposits ought to be, we cannot call any "mal-formed;" it may be abnormal, or in a wrong place, but it is well-formed in every case.

The querist is puzzled to give an explanation of the fact that dentine suffers more by abrasion than enamel, and that the teeth become concavely eroded on the chewing surface by "abrasion." Two fac-

tors come into play: First, dentine is no surface organ; secondly, dentine is softer. To understand the first factor more plainly, we have to compare the enamel with the other surface organs and their deportment in cases of injury. Wherever the surface of an organ comes in contact with air or the outer world, provisions, which we do not sufficiently understand in detail, are made against those outside influences. The skin continually throws off epidermis scales; the mouth, bronchi, etc.; epithelial debris, etc. Any injury to surface organs is quickly repaired, but if we prevent the action or formation of surface organs—epidermis or epithelium—the sloughing process goes on in the parts beneath those organs, and they, not being adapted to the direct external influences, only after long time and with difficulty recover, and then only after forming protecting layers. The same is the case with dentine. While the enamel fights successfully against external influences, as long time as they do not destroy its protecting structure, the dentine behaves like a connective tissue, or bone-substance beneath the periost, it succumbs easier to outside influences. This very fact is strongly in favor of a supply by the enamel and does not warrant in any way the sudden, hardly logical, jumping to the conclusion at the close of the little article. Such emphatic negations may be logically permitted to pulpit talkers whose whole strength lies in boldness of assertion, but not to the querist, who shows himself an astute and reliable observer.

M.

We wish you all a Happy New Year. Well, how about the new year? and how about the *old?*

Suppose we turn down the light and meditate for awhile. Let us look over our office and all its equipments. Are they all that they should be? And, above all, are they clean, or as they were left from the last patient? Are *we* what we ought to be, or have we misimproved our opportunities? Ah, how that case of a month ago torments us. Why does it persist in being present to our mind? Why had we not the ability to treat it successfully as well as the Dr. across the way, for whom we were left, resulting not only in the loss of a first-class patient, but, infinitely worse, the loss of reputation, which it is always so difficult to regain. Why do so many failures come trooping up before us? Ghosts are not very pleasant companions, are they? Well, the old year is gone, and are we not to decide what shall be the *new?* Will we have the same old experience, or will we be men, and fill

men's places in the world? In other words, *study* and *labor* till we are in the front ranks of the profession, and the public feel that we cannot be spared from their midst. Young man, are you ready for the advance? If not, remember that in the years to come your only harvest will be disgrace, when it might have been the victor's crown!

According to the Vienna Agricultural Gazette, it has recently been discovered that meerschaum pipes of excellent quality, susceptible of the highest polish, and even more readily colorable than the genuine *spiuma di mare*, may be made of potatoes. The familiar tuber, it seems, is well qualified to compete with the substance known to commerce as "meerschaum clay." Its latent virtues in this direction are developed by the following treatment: Having been carefully peeled and suffered extraction of its "eyes," the potato is boiled intermittently for thirty-six hours in a mixture of sulphuric acid and water, after which it must be squeezed in a press until every drop of natural or acquired moisture is extracted from it. The residuum of this simple process is a hard block of a delicate creamy white hue, every whit as suitable to the manufacture of ornamental and artistically executed pipe head as the finest clay. The potato, moreover, dealt with in the manner above described, promises to prove a formidable rival to the elephant's tusk. It may be converted into billiard balls as hard, smooth and enduring as ivory, and can be depended upon for an inexhaustible supply of carved umbrella handles, chess men and fans. As potatoes are plentiful all over the world, and likely to remain so, while elephants are, comparatively speaking, rarities, mankind at large may fairly be congratulated upon the discovery of a substitute for ivory, which can be produced in unlimited quantity, and at an almost nominal cost, taking into consideration the difference in price between a pound of the best kidney potatoes and a pound of prime elephant's tusk.—*London Telegraph.*

Have we here a new material for "base-plates" in artificial dentures?

It may not be generally known, but it is a fact worth remembering, that a small quantity of the unbleached sulphate of quinine, mixed with an ordinary tooth powder, forms an excellent quinine dentifrice, which not only preserves the teeth sound, and the gums healthy, but is found wonderfully efficacious for preventing toothache and neuralgia.—*Student's Journal, copied in Medical Record, Nov. 25, 1882.*

News comes from London that a cheap process of making aluminum has been discovered there, and the statement causes no little excitement among the metal workers of Birmingham and Sheffield. Aluminum has not been largely used yet, because it is too costly. However, metal workers and dealers have long been expecting the discovery of a cheap method of production which will make it available. Aluminum was sold not long ago for eight dollars an ounce, but can be bought for one dollar now, while a Philadelphia firm is said to offer it in large quantities for forty cents an ounce. It is a bluish white metal as strong as iron and only a third as heavy, and does not rust or tarnish. If the cost of making it can be brought down to a practical figure, it will be widely used in structures where lightness and durability are wanted. Prof. Newberry of Columbia College says: The process of production and the cost of bringing the ore from which it is made from Greenland have hitherto made it expensive. It ought really to become cheaper than iron, for it exists in an impure state in all our clays, and consequently the ore is more abundant than iron ore. Mixed with copper and other metals, it yields splendid bronzes which, like the aluminum, do not tarnish. If it can be cheapened, aluminum bronze will certainly supersede brass.—*Republican.*

More tools are ruined by overheating, coldhammering and overtempering, says the Scientific American, than can be redeemed by all the new recipes that have been invented. The only way that is really good is first to find a brand of steel that is good and suitable for the tools to be made, and stick to it. Next find by a few trials the lowest heat that will harden it in pure water at 70°, or ordinary shop temperature. If steel is hardened at the lowest heat, the temper will require drawing very little, that is, to a pale straw, full straw, or brownish yellow, but not deeper unless for wood-working tools with thin cutting edges, when a full brown may be desirable. File-makers use salt water for a hardening bath, because it makes the water more dense and the teeth harder, and of course more brittle. Sulphuric acid or mercury is sometimes used for hardening very small tools for cutting glass and etching stone. For springs the same care should be taken in regard to low even heating that is necessary with tools. Pure lard oil is as good and probably better than any of the many mixtures that have been tried for the hardening fluid; burning off may do for drawing the temper of small or thick springs, but is totally unfit for long or slender ones. Dip the hardened spring into a bath of oil heated nearly to its boiling temperature; this is the only way to get an even temper.

BABBITT METAL.

The alloy recommended by Dr. Haskell for dies in place of zinc is not a *true* Babbitt, but differs in that it contains but about half the amount of tin. There are many alloys used for machinery bearings, and sold as Babbitt metal, but it is almost impossible to find a lot made from the correct formula. The most common adulterant is lead, which, of course, lowers the price very materially, but renders the alloy absolutely unfit for dental purposes. We believe the alloy made from Dr. Haskell's formula ought, as he says, to drive zinc out of the laboratory. Take the formula in the August number of this Journal to any coppersmith and have the alloy made for about 35 cents per pound, or purchase none other than the S. S. W., at 50 cents, and give it a trial. Well, throw away your old zinc ! ! !

EUCALYPTUS.

We would be pleased to hear from members of the profession who are using this new antiseptic. Will it ever *supplant* carbolic acid, or will it simply be an *associate* of our *old friend?* Let us compare notes and learn all we can about it, and then give it its proper place in the medicine case, or, if need be, like many of its predecessors, throw it out altogether. From our short experience, we believe it has come to stay, and claim its place, *but not to supplant carbolic acid.*

In setting pivot crowns with gutta-percha, we have many times been obliged to heat them to so high a temperature as to cause considerable pain in carrying them fully to place. The thought suggests itself that pliers might be constructed with blunt beaks (perhaps of copper to hold the heat), and so formed as to firmly hold the crowns. With these heated to a suitable temperature, the work might be more perfectly done and the amount of pain reduced.

Edison has constructed for Prof. Fairfield of the New York college of veterinary surgeons an electric lamp which makes a 500-candle power in the area of a half-dime. The electrodes or carbon points are only one tenth of an inch in diameter, the object being to obtain the highest intensity within the smallest possible space. It requires a battery of about forty cells. The instrument was made to illuminate a microscopic objective constructed upon the newly discovered law of homologous sections.

In the Scheriff process for preserving milk, the milk while fresh is inclosed in glass vessels and heated by steam for from one to two hours to a temperature of 100° to 120°. All germs of fermentation are thus destroyed, the caseous albuminoids are peptonized so that the gastric juices can easily digest the finely divided flocks, and any germs of disease from which the cow may be suffering are killed.

Muhlenberg says that "if the vitality of a rabbit is lowered by the administration of phosphorus, micrococci, which under other circumstances do no harm, increase so rapidly as to be fatal."

SOCIETIES.

CONNECTICUT VALLEY DENTAL SOCIETY.

[Continuation of Report.]

EVENING SESSION—FIRST DAY, Oct. 26, 1882.

Opened at 7 P. M.

SECTION 2—Discussion of Dr. Stockwell's paper.

Dr. MILLER: I would like to ask if the germ theory will account for decay that has started and then stopped?

Dr. SEARLE: Take a tooth and fill it with tobacco, and then see.

Dr. MILLER: But we have decay of teeth where no tobacco is used, and that has stopped.

Dr. NILES would like to ask Dr. Stockwell about mouth-washes. It is stated, I think, that alkaline washes are in some cases worse than useless. Is it better to substitute acid washes?

Dr. STOCKWELL: In certain cases.

Dr. NILES: In what cases?

Dr. STOCKWELL: The reference to acid washes was made upon the basis of some of Tyndall's experiments. In case the saliva is acid, this condition is favorable to the development of a certain class of germs. If it is alkaline, or neutral, another class of germs will find favorable conditions for development. The use of soda water is indicated on a scientific basis only. We should first *know*, not guess, that there is an acid condition to be neutralized before an alkaline wash is prescribed. When an alkaline condition of the fluids of the mouth is habitually present, soda water, etc., can only be harmful.

Dr. Searle: I hope no one will get the impression that we are committed to the germ theory, or to any theory. We are trying to find the etiology of caries. If the birds of prey are not in one field, they may be in another, and our friends here may be able to help us find them.

Dr. Niles: I never supposed that soda water was intended as a mouth-wash. Carbonic acid is a solvent of tooth substance; carbonate of lime in water hardens it; boiling such water precipitates the lime, liberating the carbonic acid gas, and it makes the water soft. So far as the claims of the acid theorists, I do not understand that specific acids are present except in dyspeptic conditions. Where decay progresses slowest, the decay is darkest. Where neutralized conditions exist, there is no decay, or decay is stopped. The difference between acidity and fermentation consists in this, that where there is fermentation, there are micrococci present. These organisms produce acid, and thus produce softening of tooth substance. If there is as much lime-salts in the decayed substance as exists in the undecayed, we must account for the hardness of teeth on another basis.

Dr. Abbott: For many years I have looked upon the solution of teeth by acids as a theory of decay highly doubtful. I have long thought it needed support. The theory of decay by septic organisms, despite the work of English scientists, I think needs considerable support. Go back to those students who in earlier times investigated this disease. You will see that John Hunter thought it a condition of inflammation of dentine. I have many specimens to prove this to be true. I have held opinions upon this subject differing from any of which I have read. Septic theory! A structure that contains less than a third of organic matter that can be bored up by an organism—I don't understand such a performance. Several weeks since your secretary asked me what evidence I possessed in favor of an acid theory and the septic theory of decay. I wrote him that I did not believe in the acid theory nor in the septic theory; that I did believe in an inflammatory theory. In the dentine there is but 28 per cent. of organic matter, and in enamel but three or four per cent. Therefore, if the acid theory was true, the enamel would be wasted the most rapidly of any portion of the tooth; but this is not true. If Dr. Bödecker has found life in the enamel, is it not possible that it may be irritated? The terminal ends of these fibers of living matter are so covered over that they are not exposed until a portion of the surface

is dissolved. When this happens, the living matter becomes irritated; also, where the gum has receded from the tooth, we find extreme inflammation and tenderness—hypersensitiveness some call it, but they do not realize that it is irritation of living matter. Leber and Rottenstein find that leptothrix cannot enter the solid or well-formed tooth-structure. Dr. Nasmyth found fifty years ago the baccated appearance in decayed substance. We have bacteria in decay. The micrococcus is an oval or berry-shaped or an hour-glass shaped organism. (Illustrations upon the blackboard.) Prof. Mayr's statements I can agree to, because I have no reason to object to them and because I do not know anything about acids or alkalis in the mouth as productive of what is claimed for them. But this (makes diagram drawing) substance that becomes so soft, becomes as hard as flint if the local conditions and constitutional conditions are corrected. Why is this? What becomes of these gobblers?

Dr. Stockwell: These organisms have a relatively short life, and if the supply is cut off by a filling that hermetically seals the cavity they of course soon die, or are overcome by the interior vital forces.

Dr. Abbott: But how strange that these organisms should chew up teeth when they have so much in the mouth beside to live on! Dr. Searle's case reminds me of one I had a few years ago: A man called upon me who had not been in a dentist's chair before in twenty-two years. A molar appeared to have an old gold filling in it; it proved to be a plug of cotton, the size of a pea. I thought it very curious, and as there was a discussion upon the subject of cotton in teeth at that time going on between Drs. McQuillen and J. Foster Flagg, I sent the plug to Dr. Flagg to assist him in his theory, which was that it made a very good filling in some cases, while Dr. McQuillen maintained it would be destroyed. The cavity above this cotton was solid—no decay there at all. Now cotton is a vegetable substance, and dry, it will exclude germs; but moist cotton will not. My idea was that the food being kept out, the lime-salts could take their proper position and decay was stopped.

Dr. Shepard: I would like to ask if Dr. Abbott finds the globular and inter-globular spaces.

Dr. Abbott described these as the interzonal spaces, so-called by Dr. Atkinson. There are an unlimited variety of such spaces found in dentine.

Dr. Searle: I wish to ask if Dr. Abbott can account for decay of one tooth while its neighbor in contact is free from attack.

Dr. ABBOTT: All teeth are not alike in structure; a pit, a scratch may be sufficient to be a recess for decomposing food, and softening must result.

Dr. BARTHOLOMEW: What is it that causes irritation upon the surface of the neck of a tooth?

Dr. ABBOTT: There is a large amount of living matter at that point, and as the gum recedes it becomes exposed. The acid that forms in mouths where such receding occurs, is sufficiently concentrated to irritate, and I treat such cases with carbonate of soda, tannic acid and glycerine. Putrefaction of any organic substance will produce lactic acid, and this must have an influence on lime.

In response to an inquiry from a member regarding the application of his inflammation theory to decay of "dead" teeth and ivory teeth inserted in artificial dentures, Dr. Abbott finally admitted that possibly the germ theory would apply in such cases.

Dr. ATKINSON: Than to say what I know, it would be easier to say what I don't know about this interesting subject. One great fault is the false nomination at the bottom of this subject. There is no antagonism between acids and alkalis. The antagonism exists in our false conceptions of primal truths. Germs is another false nomination. We must understand the great beginning—the laws of tissue-building first, before we can properly conceive of a retrograde movement of any kind. We must understand the structural organization of the tooth if we would explain the movements going on within. Inter-globular spaces are remnants of the law of calcification of dentine—or the embryonal bodies thereof—being incomplete. Is it an *over* calcification, or are they caused by a *lack* of calcification? It is imperfectly finished work, but just how, is not settled. This condition differs materially from the spaces found near caries, these last being a return merely to the embryonic condition.

SECTION 3. Dr. NILES remarked, making his report, that he was much discouraged by the disappointments of the last meeting. He thought that the members had not supported him in furthering his work; that members of Sections ought to do all in their power to assist the committees. Sickness in his family had, with many other cares, prevented his personally doing much the past year. He would, however, take the liberty of introducing the subject of Phosphate Filling Material. He believed it possible to have a permanent phosphate filling material, and that it can be so prepared as to be permanent. Long struggling with non-cohesive gold had taught him much.

He had thought it the best and only proper way to use it for filling teeth, but he had lately given much more time to the study of phosphate filling. He believed that there are phosphate fillings now made that will be serviceable for six or eight years. We have failures with gold and failures with amalgam, and I believe that failures with a *dark-colored* cement filling will not be in greater proportion than to gold and amalgam, while the cement will answer a far better purpose, is easier of adaptation, and will give better satisfaction during its term of service.

PAPER—Subject: *Phosphate Filling Material.*

Discussion.

Dr. SHEPARD: In experimenting upon cements, I think the key to the whole matter is a knowledge of the chemical laws, while at the same time one must keep a careful record of the *make* of cement or gutta-percha he uses, so that after long periods reference to this record will show which make wears best. One patient said recently that an oxy-chloride zinc filling had been in the buccal cavity of a molar sixteen years. I fear this statement was a little exaggerated. The conditions of the particular mouth are to be considered, and the probable effects of these conditions upon the durability of the filling; also, the different methods of mixing the same kind of filling material. I think, with Dr. Niles, that it is possible to make durable fillings of oxy-phosphate, or even of oxy-chloride, if chemical laws are carefully understood. *Record* your cases; state whether rubber dam is used or not, the time kept dry, etc. Experiment in your laboratory with each filling material, and learn the best way to mix it.

Dr. NILES: Cements, where in liquid state, are hydraulic; therefore, slow setting, and the saliva which gets to the surface will often facilitate the setting of the cement. The heat of the tooth also facilitates the setting. Dr. Bödecker uses Poulson's cement. It is an English make, very expensive, but is in every way a first-class article.

Adjourned to Friday, A. M., 9 o'clock.

The eighteenth annual meeting of the Massachusetts Dental Society was held in Codman and Shurtleff Hall, Boston, Mass., December 14 and 15, 1882, the President, Dr. D. B. Ingalls, of Clinton, in the chair.

The records of the last meeting were read and approved.

Reports of the various officers and committees were acted upon.

Voted, That the next semi-annual meeting be held in Springfield, Mass.

Dr. C. A. Brackett, of Newport, R. I., read the annual address.

Dr. D. F. Whitten, of South Boston, read an essay on "Treatment of Devitalized Teeth."

Dr. D. D. Smith, of Philadelphia, read an essay, "Discrimination in the Use of Filling Materials."

ELECTION OF OFFICERS FOR 1883.

President, Dr. F. Searle, Springfield.
First Vice-President, Dr. A. B. Jewell, Newton.
Second Vice-President, Dr. D. M. Clapp, Boston.
Secretary, Dr. W. E. Page, Boston.
Treasurer, Dr. E. Page, Charlestown.
Librarian, Dr. R. R. Andrews, Cambridge.

Executive Committee.

Dr. D. F. Whitten, South Boston.
Dr. F. E. Banfield, Boston.
Dr. J. S. Hurlbut, Springfield.
Dr. J. F. Adams, Worcester.
Dr. Leon Rideout, Lynn.

Voted, That Dr. J. T. Codman read his essay, "Reminiscences of the Society," at next meeting.

Dr. W. E. PAGE, *Secretary.*

We are kindly furnished with the following

OBITUARY.

Dr. Amos Johnson, the oldest dental practitioner in the city of New York, died December 10, 1882, at his late residence, 239 West Thirty-Eighth street. The services, which took place on the 12th ult., were largely attended by professional friends. Interment was made at Woodlawn cemetery.

Dr. Johnson was a graduate of medicine, which he practiced successfully in connection with dentistry. During his busy professional career he found time to write, and he leaves a large amount of unpublished manuscript, which he intended to have published in book form, it being the culmination of his long life-experience, study and investigation.

Dr. Johnson was an example of the Christ-spirit; the latter part of his life was mostly spent in "going about doing good." He was a genial and true friend, and lived a life without spot or blemish. His meek and lovable disposition endeared him to all who knew him.

P.

THE

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ORIGINAL COMMUNICATIONS.

SOME FALLACIES OF THE BIOPLASSON DEFENSE.

In the December number of the New England Journal of Dentistry is an article by Dr. E. S. Davenport, entitled "The Bioplasson Doctrine and its Critics," which professes to be a review of a paper of mine in the Dental Cosmos for August last.

The substance of my paper is as follows: I first describe Dr. Heitzmann's "Bioplasson Reticulum" in a way which seems to have been satisfactory to him. I then quote his method of seeing it. He says:

"Add to a drop of fresh blood a small drop of a forty per cent. solution of bichromate of potash. This will within one hour extract the hemoglobin, and you must succeed in seeing the reticular structure in each red blood-corpuscle." . . .

"Take a drop of pus, fresh, without adding anything, and you will see the wonderful structure in each pus-corpuscle *with great ease*."

"In the perfectly fresh blood you will see the structure in each colorless blood-corpuscle."

The objectives required were "a first-class one-tenth immersion."

According to the directions, I added a forty per cent. solution of bichromate of potash to blood, and examined the red corpuscles. But they had become so shrivelled and distorted that I was unwilling to accept the appearances seen in them as evidence of actual structure.

In the pus-corpuscle and white blood-corpuscle, the reticulum was seen distinctly when the cover adjustment was wrong, but disappeared when it was set right. The corpuscles then appeared full of fine granules, with nothing visible between them. The best homogeneous immersion glasses would not show the net-work at all.

I had sent drawings and descriptions of these appearances to Dr. Heitzmann. He replied: "You draw everything in and out of focus; you should draw only what is clear and sharp in ONE focus."

I insisted "that the only proper and honest way to draw, is to draw everything exactly as you see it, without any change at all."

The paper was illustrated by several of my own drawings; three drawings of the net-work, by Dr. Heitzmann himself, from Dr. Elsberg's paper on the blood; and one drawing of a white blood-corpuscle, from Klein's Atlas of Histology.

My drawings represented the corpuscles full of fine granules like those of the figures criticised by Dr. Heitzmann. The other figures were recommended to me by Dr. Heitzmann as excellent illustrations of his views. Dr. Klein's drawing, he says, shows "the net-work *even nicer than it really appears*." This figure was rounded, nearly an inch across, and was covered with a net-work of fine lines, thickened at their points of intersection. It contained two nuclei traversed by a still closer net-work. The other drawings were probably enlargements of the net-work, as seen in Dr. Klein's figure. They showed Dr. Heitzmann's idea of the net-work dilated, at rest, and contracted. They represented fibers passing off in various directions, from small round bodies, and connecting with other similar bodies so as to inclose spaces. In the dilated condition, the bodies were small, and the threads connecting them long and slender, while the inclosed space was large. In the contracted condition, the bodies were larger, the connecting threads short and thick, while the inclosed space was small.

I spoke of a well-known fact in optics that round bodies placed close together produced the appearance of a net-work of hexagons, especially if the bodies are not distinctly seen. As an illustration of how liable even skilled observers are to be deceived by such an illusion, I referred to a well-known discussion on the structure of a certain test object. This object was, at first, supposed to be covered with a net-work of hexagons. Further investigation showed that it was composed of little beads joined together so as to form a plate, and that the net-work was only the imperfectly seen interspaces be-

tween the beads. But the error had been so firmly fixed in the minds of many that they clung to it until long after repeated demonstration had convinced all unprejudiced observers of its falsity.

I also referred to another structure called *amphipleura pellucida*, which is used as a test for the microscope. "This shell is marked with lines $\frac{1}{90000}$* of an inch apart. When it was shown that these lines had wavy edges, which gave them an appearance somewhat like that of a rope, one of the most difficult of feats was thought to have been accomplished. From this appearance and the analogy of other similar structures, it was *inferred* that the lines were rows of beads. Beads, then, $\frac{1}{90000}$ of an inch in diameter, are almost beyond the border of microscopic visibility."

I estimated from the well-known size of a white blood-corpuscle, about $\frac{1}{2500}$ of an inch, that Dr. Klein's figure was magnified at least two thousand diameters. "The meshes in Dr. Heitzmann's drawings are not less than five or ten times as large as in Dr. Klein's. If we may judge from these facts, then, Dr. Heitzmann's figures represent objects magnified *ten or twenty thousand diameters!* Let us look at these figures a little."

"The nodal points at the intersection of the lines are largest in the drawing which represents the net-work as contracted. In this drawing, the nodes are about one-fourth of an inch across. If we suppose the figure to be magnified twenty thousand diameters, the real size of the bodies would be $\frac{1}{80000}$ of an inch. But, not to press matters, say it is magnified only ten thousand diameters. This would give the bodies a size of $\frac{1}{40000}$ of an inch. Such bodies might be seen without excessive difficulty with a good high-power glass. There are, however, some other difficulties that we may consider."

"An ordinary white blood-corpuscle rarely, if ever, exceeds $\frac{1}{2000}$ of an inch in diameter. If these figures represent portions of such a corpuscle, then twenty of the nodules placed in a row would extend across the corpuscle, not counting the interspaces. But the interspaces, even in this figure, are about as large as the nodes. Turning to Dr. Klein's drawing, we see that between twenty and thirty nodes are found in the diameter of the body. Twenty nodes of $\frac{1}{40000}$ of an

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*The fraction is, of course, an average. Dr. J. J. Woodward says (Monthly Microscopical Journal, April, 1871): "The frustule selected for the above photographs counted 91 striæ to the thousandth of an inch. Larger frustules exhibited rather coarser; smaller ones, rather finer striæ." His conclusion is now accepted.

inch, and twenty interspaces of the same size, would be somewhat crowded in a space of $\frac{1}{2000}$ of an inch."

"In the drawing showing the net-work in a relaxed condition, the nodal points are only one-sixteenth of an inch across. Here we are in a much better condition as regards room, but there arises another serious difficulty. If we still suppose that our corpuscle is magnified only ten thousand times, we shall have here a body $\frac{1}{160000}$ of an inch across, about one and three-fourth times smaller than those beads of *amphipleura pellucida*, which are so small as never to have been clearly seen."

"Again, the widest of the lines which connect these nodes are less than the thirty-second of an inch across, and the narrowest much less than this. Does he really expect us to believe that he, or any one else, can see lines less than $\frac{1}{320000}$ of an inch across, and lines, too, exceedingly pale, and imbedded in a mass of tissue like them in color and appearance?"

My views had been considered by a large number of microscopists of eminence, every one of whom agreed with me, if he expressed any opinion at all. The American Society of Microscopists had, at their meeting in 1881, considered them favorably.

I concluded by saying that, as the lines in the net-work had been shown to be so fine as to be invisible, and, as an optical illusion resembling the net-work was easily produced, I considered that I was justified in my opinion that the net-work was an optical illusion.

Dr. Davenport's article opens with a discussion of inventors and discoverers; then follow some personal observations about myself, and then a panegyric upon Dr. Heitzmann. On the fifth page of the article (page 389), he says: "From the perusal of Dr. Curtis' article in the August Cosmos, one would quickly conclude that of the three 'R's,' he takes the most delight in '*Rithmetic*, and while evidently believing the old adage, 'figures do not lie,' seeks to prove by their infallibility that diagrams *do*. While taking strong exceptions to that part of Dr. Curtis' article which insinuates against the honesty of Dr. Heitzmann, the writer of this report passes it without comment." . . .

"That Dr. Curtis should 'laugh to scorn' the diagrams drawn by Dr. Heitzmann to illustrate his writings, when in Germany he was considered one of the best and clearest artists in that line, and was much sought after to illustrate many noted standard works." . . Then follow some personal observations not necessary to quote.

"He counts the lines of living matter represented in one of the

diagrams, also the interspaces, the sum of which he multiplies by the width—per linear inch—of each line and interspace, divides by the number of diameters which he supposes the specimen to have been magnified, and his conclusion gives him so large a corpuscle that he says at once: 'This diagram is faulty, is made to order;' hence Heitzmann's bioplasson reticulum is not present! Does Dr. Curtis expect diagrams drawn off-hand to represent, as if they were photographs, lines and interspaces absolutely correct as to number and positively accurate as to their width, even to the thousandth of an inch?" . . .

. . . "He asserted at the meeting of the American Society of Microscopists, at Elmira, last August, that the reticulum, or something like it, must be present to account for the contraction, extension, etc., of the living matter, but that he could not see it, which certainly seems to be sensible talk."

Dr. Heitzmann had attempted to answer my first paper by saying, in effect, that I disbelieved in the net-work because I did not know how to use the microscope well enough to see it.

Dr. Davenport quotes this answer, and says: "The above would seem to be a sufficient answer to the assertions of a comparatively non-distinguished microscopist, unsupported as those assertions are by any well-defined explanations, or the corroborative evidence of men of note."

The short remainder of the article does not relate to my paper, and I will pass it by.

The above I believe to be all in Dr. Davenport's article, aside from the personalities, that bears on the point at issue.

The two papers are now, in substance, before us for comparison. Every candid person will, I think, agree with me that I have not been fairly represented.

It is said that I disbelieve in the net-work solely because I have not seen it, and that my objection to it is not sound because others have seen it. If such were the ground of my objection, there might be some justice in the exception against it. But a glance over my paper will show that I base my objection on something quite different. I have seen appearances exactly like what Dr. Heitzmann figures, and have given what I consider the only possible explanation of the cause of the appearances.

I regret that Dr. Heitzmann seems hurt at what I say about his criticism of my drawings, but I must maintain that my view is correct.

For scientific purposes, one must draw an object exactly as he sees it; no change, whatever, is allowable; even diagrams are to be used sparingly, and should be accompanied by accurate drawings. Any other course leads to endless confusion and misstatement.

The part beginning, "That Dr. Curtis should 'laugh to scorn,'" etc., plainly misconstrues my meaning. My object was not ridicule, but to show that the lines represented in the net-work were so fine as to be invisible. If the argument is too complex, it may be made simpler. A glance at Dr. Klein's figure will show that, if we include the nuclei, there are about thirty spaces in its diameter.* If we call a white corpuscle $\frac{1}{2000}$ of an inch, the spaces cannot average more than $\frac{1}{60000}$ of an inch across. Will Dr. Heitzmann, or any of his friends, estimate the width of the lines inclosing these spaces?

I had supposed that the mere mention of the name would be sufficient to remind one who claims to be a leader of microscopic thought, of Professor Abbe's demonstrations. But it seems necessary to expand the hint. Professors Abbe and Helmholtz both showed, years ago, by mathematical demonstration, that the finest lines, visible by direct light, were about $\frac{1}{90000}$† of an inch. With the utmost of obliquity, under certain exceptional conditions, it was theoretically possible to distinguish lines $\frac{1}{120000}$‡ of an inch. Since the introduction of homogeneous lenses, this limit has been extended, and it is now theoretically possible, with the extreme of obliquity, to separate lines $\frac{1}{146528}$ of an inch; but this is the extreme of theoretical limits and will, perhaps, never be reached.

These conclusions are accepted by mathematicians, and Dr. Heitzmann might as well quarrel with the multiplication table as with them. And yet, he asks us to believe that he can show lines in the white blood-corpuscle the thickest of which are less than the $\frac{1}{300000}$ of an inch in width.

Dr. Davenport objects to my criticism of these drawings. They must be treated tenderly, because they are "diagrams drawn off-hand." But they were offered as an illustration of what was seen, and as proof of its existence, and it is absurd to claim that, because they are diagrams, they are not subjects for criticism. Observe that I do not

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*The nuclei were not included in the former enumeration of the spaces.

† More exactly $\frac{1}{3636}$ mm., or $\frac{1}{92000}$ of an inch.

‡ $\frac{1}{4848}$ mm., or $\frac{1}{122000}$ of an inch. These figures are from Professor Helmholtz's article, first published in Poggendorf's Annalen for 1874.

insist that the lines shall be "absolutely correct as to number and positively accurate as to their width, even to the thousandth of an inch." I allow plenty of lee-way, but I do demand that they shall represent objects possible to be seen. And I have shown that they represent objects impossible to be seen.

I would also call attention to an inaccuracy in this paragraph. The sentence, "'This diagram is faulty, is made to order;' hence Heitzmann's bioplasson reticulum is not present!" is in quotation marks. Quotation marks imply a reproduction of the words another uses. I have neither used such words, nor do they represent correctly the meaning of anything that I have said, as may be seen from what has gone before.

The writer is also misinformed as to the words I am said to have used at Elmira last August. I neither there nor elsewhere have ever said, or believed, that the presence of a net-work is necessary to explain amœboid motion. The net-work was, indeed, discussed at the meeting, but although it was an extremely interesting subject to me, I took no part in the discussion. Many said that they had been studying the subject but, with two exceptions, all who spoke agreed with my published views. One of these exceptions was a student of Dr. Heitzmann's. He said, in a very hesitating way, that he had seen the net-work occasionally, but he made no attempt to answer the objection that it might be an optical illusion. The second of these exceptions thought there ought to be such a thing, for it made a very pretty theory, etc. He thought, but was not quite sure, that he had seen it while studying the subject with another member of the society who was present. The other member referred to was a much more practiced observer than the former. He said most emphatically that the net-work was not to be seen at that time. One speaker had been shown the net-work by Dr. Heitzmann, while a student in his laboratory, some years ago, but had never been able to see it in his own laboratory. The same gentleman afterwards told me that he had always regretted that a disinclination to disagree with a teacher older and more experienced than himself, and one who was, besides, impatient of contradiction, had induced him to appear to accept what he never has believed. The president of the Society was shown the so-called net-work by Dr. Heitzmann while visiting him in his laboratory. Being a guest, he disliked to say that he thought the objective was out of adjustment and the appearance an illusion. At home, he found that, by putting his objective out of adjustment, he could see

exactly the same thing as in the laboratory; this disappeared when the objective was set right. He was certain, therefore, that the net-work was an illusion. At the meeting of the American Association for the Advancement of Science, Dr. Elsberg read a paper on the net-work, which met with a similar disapproval.

The whole of my argument answers the last quotation from Dr. Davenport, except the personality. For "explanations," I have shown that it is natural to expect an optical illusion just where the net-work is said to exist. I have shown that such an illusion can be easily produced. I have shown that some of the structures said to show the net-work were so altered by chemicals as to be useless for any such purpose. I have shown, finally, by indisputable optical laws, that the lines said to make up this net-work are far too fine to be seen with any microscope.

It would seem that this is "well" enough "defined" to satisfy any one. And, when the theory is repudiated by two of the most prominent scientific bodies of this country, and by the great body of microscopists, including, to my certain knowledge, some of his own students, I think I have "corroborative evidence" enough "of men of note."

These objections have nowhere been met. Instead, the attempt has been made to sink out of sight those arguments which seemed to tell the most against the theory. Others, I am sorry to say, have been misrepresented, I hope unconsciously.

The personalities I shall not answer. They were probably the hasty ebullitions of an excess of wit, which mature reflection would have omitted.

In conclusion, I would say that, until I am answered by something far better than has yet appeared, I shall consider that I have proved that this net-work in the pus-corpuscle and in the white and red blood-corpuscle, at least, is only an optical illusion.

LESTER CURTIS.

1558 Wabash Avenue, Chicago, December 28, 1882.

"WE ALL LIKE SHEEP HAVE GONE ASTRAY."

BY DR. WM. H. ATKINSON, NEW YORK.

Read at the Annual Meetings of the American Academy of Dental Science, and Connecticut Valley Dental Society, October, 1882.

This saying is verified in society by the prevalent habit of following leads without due examination as to whither they tend. In no case is it more common than in popular instructions to secure and maintain health of body and peace of mind. Soundness of body is essential to clear and regular mental exercise, and this is requisite to proper performance of bodily function. A sound mind in a sound body is the example of health to which all are invited. But what constitutes the soundness is not so well defined. One set of inquirers maintain that man was created perfect and fell away from soundness of organization, inducing suffering and death. Another set assert that man has never attained perfection of structure and wholeness of function, but is approaching it through his surroundings. Whether pain and misery be the offspring of the one or the other hypothesis, the fact remains that there is no extant example of complete harmony of function on earth among men, savage or civilized. Civilization has been the bane and also the blessing of the human race.

So far as density of population is concerned, savage races can only survive upon a territory large enough to afford them food by the capture of wild animals which belong to wild countries, and such vegetables as grow spontaneously therein. Domestication of Plants and Animals tends to their multiplication by reason of protection from their natural enemies. Savages who eat unprepared foods wear their teeth out very fast, and therefore do not live as long as civilized people who lessen the wear of the teeth by fine division and cooking of their food. So long as bodily completeness depends upon food supply, the necessary quantity must be forthcoming, or lack of the whole body, or some part thereof, will initiate incompleteness or inharmony of the functions of the body or mind, or body and mind—which in turn introduces disease by starvation, which, if continued, results in death of the body. Adaptation of food to feeder, or, as it is called, quality of food, is a prime factor in securing perfect digestion.

Feeders are of three classes: Carnivorous, Vegetarian, or Omnivorous in constitution.

Carnivora bolt their food, and the digestory apparatus fluidifies it into pabulum for assimilation.

Vegetable-feeders must comminute grasses, grains and fruits, so as

to make them amenable to solution in the very complicated apparatus for digestion belonging to this class of feeders.

Omnivora have a digestory apparatus, which is a compromise between the simple and short intestines of the Carnivora and the involved, complicated and long alimentary canal of the vegetable-feeders.

The teeth are the best index by which to classify feeders. Carnivora have teeth adapted to catching, holding and tearing their prey.

Herbivora have teeth adapted to collecting, cutting off and finely dividing the various articles upon which they live.

Omnivora have teeth adapted to cut, tear and grind into a pulp their food, thus presenting us with a means of classification at the very entrance to the digestive tract.

According to this discrimination, man belongs to the Omnivora. Savages, as a rule, devour their food without any or with little preparation or cooking. Civilized races invariably prepare and cook their food more or less, thus doing part of the work of digestion and of the digestory organs, which savages charge their internal apparatus with doing unaided. The way in which the importance of the teeth became known to mankind was through their loss or disease, by neglect or abuse—the former being the initiative and chief factor in the imperfect development and mal-arrangement of the masticatory apparatus. This lack of exercise of the jaws and teeth induced weakness of structure, and laid them liable to the disintegrative processes of fracture and decay. Up to the time of Goodsir, naturalists, students of anatomy, physiology, pathology and therapeutics, and medical practitioners, knew next to nothing of the embryological evolution, arrangement, succession and significance of the human teeth. By reason of this unseemly neglect, and ignoring of this important study in medical schools, a sort of empirical observation and study arose, in the main by men unlearned in professional matters, consisting of barbers, hair-dressers, shoe-makers, blacksmiths and others, who became the extractors of aching teeth. In course of time the people discovered that the loss of the teeth entailed debility and disease, in the various forms of indigestion and its concomitants, and thus was laid the foundation of artificial substitutes for the lost natural organs, in hope of mitigating the sufferings of dyspepsia, so prevalent among those who had lost their natural teeth. And thus a new branch of the healing art took its rise out of human necessity, which is fast becoming the divinest practical blessing to civilization in modern dentistry.

At first, substitutes for lost natural teeth were resorted to by ladies, for æsthetic reasons, who had lost upper front teeth. These were made of white wax, and only worn at parties and in society. Next, natural teeth were grafted on to natural roots of upper front teeth; these proved serviceable in eating, and could be worn constantly. At length, transplanting straight rooted teeth was resorted to, which fell into disuse because of the transmission of disease in some unfortunate cases. Then substitutes, carved of ivory to replace one or more teeth, came in vogue. And then porcelain teeth, of crude form and color, were attached to metal bases of wire and plates so formed as to take hold of such natural teeth as remained in the mouth, and were made use of with greater success than anything yet devised. Then entire sets were made, sometimes of ivory blocks, and sometimes of human teeth, on metal plates, and kept in position by spiral springs so attached to both upper and under pieces as to continuously press them against the gums and keep them in place. These were much resorted to for a long time; in fact, are in use in Europe to some extent still. The next advance was the introduction of what is called "continuous gum" sets, which consist of porcelain baked upon platinum plates, so as to represent the teeth and gums in an admirable manner. These are little used, and have never met the favor they deserve. Porcelain blocks led to continuous gum, and this to a fluxing of a very low grade of porcelain, or rather porous glass, around single and block porcelain teeth, with and without gums to constitute a plate or base for the teeth without using platina or any metal. This process was called by the name of the patentee, "Satherthwaite." In turn, a modification of this was introduced as an entire porcelain base, all made at the same carving, of a really porcelaneous body. This has never met with much favor among dentists for many reasons: among which are difficulty of securing accuracy of fit and want of naturalness in appearance and feel to the wearer. Patients say it is too much like "crockery," and annoys them by "clicking" together in the mouth. (Satherthwaite, Loomis and Wright, Dunn, etc.) And now, the bane of patient and dentist made its advent in the shape of vulcanite as a base for artificial substitutes for the natural teeth. The execrable stuff met with favor of dentist and patient to such a degree as to nearly exclude from general use all other forms of base. Celluloid next came before us and had many advocates, but has not and cannot displace rubber for two reasons. First, it is a non-conductor of thermal and nutrient currents, like rubber; and, Second, it requires

more tact and skill to make, besides lacking the durability of rubber. These are both detrimental to health, principally on account of their non-conducting properties—thus heating and scalding the membrane over which they lay, changing the secretion of normal mucous to pus by inducing an inflammatory process by which the nerves of sensation and circulation become paralyzed, instigating loss of tone to the gum and bone covered by these non-conductors of nutrient, thermal and galvanic currents, so essential to taste and to the healthy nutrition of the soft and hard parts of the jaws. The stealthy and insidious manner in which such wide-spread mischief is brought about makes it imperative to direct attention to it in such terms and with such persistency as to arouse those who prescribe and make, and those who wear these noxious bases, to carefully examine into the matter. In the times of ignorance, such sins as commending the use of and providing these inevitably injurious substitutes for natural organs may be winked at in comparative innocence; but so soon as attention is called to the facts in the case, it is no longer *venial* to continue the habit, but a *crime* perpetrated through the weakness or wickedness of those who persist. To be able to calculate probabilities, it is necessary to be acquainted with the underlying principles involved in any subject. But in the supplying of means of protection to the body from evil, or remedy where evil has already done some of its work, the duty of those who attempt preventive or redemptive procedure is enhanced to the highest degree of moral responsibility.

Such has been the advance in the knowledge of the principles and practice of dentistry as to make it no longer excusable in those who engage in it to plead ignorance of the effects likely to follow upon the adoption of means and methods in their practice. When we wish to protect the body from the effects of low temperatures, we wisely resort to non-conducting material for clothing to economize the heat of the body so necessary to the full circulation of the fluids upon which it is sustained in good working order. But whenever we are under the necessity of supplying artificial supports or substitutes for the lost tissues and organs or parts of organs, as in examples of surgery in supporting displaced organs and in supplying lost parts, we must use such materials as are most nearly allied in conductivity to the tissues themselves, so as not to interfere with the complete play of the fine currents which constitute the true physiological actions of the body in respiration, circulation, innervation and nutrition. Bases for the support of artificial teeth hold a mid-way position between cloth-

ing and substitute for lost parts. In so far as mucous surfaces are covered, the secretions of mucous and normal nutrition are interfered with to a greater or less degree, in accordance to the non-conducting or conducting qualities of the material of which the base is constructed. Moreover, the conductivity may be so much higher than that of the tissues in some of the noble metals as to render bases made of these objectionable to many nervous and hypersensitive constitutions. There is no constitution, however, in which non-conductors, such as rubber and celluloid, will not work mischief and destruction, especially when continuously worn in position day and night. Whenever any tooth in the arch (except the wisdom teeth or third molars) is lost, it should immediately be replaced to avoid mal-occlusion of those adjoining it. Hence, all roots of teeth should be preserved, when they can be rendered healthy, upon which to insert artificial crowns, be they incisors, cuspids (eye teeth), bicuspids or molars. In case roots cannot be rendered firm and wholesome, they should be removed at once, before the adjoining teeth are forced from their true position in the arch. In such cases, artificial crowns, with or without gums, should be set, to complete the cordon of masticators and thus keep up the support so necessary to efficient use of these transcendently useful organs at the very head of the digestory apparatus.

All teeth having imperfections of form or cavities of decay in them should be put in charge of a competent dentist, who should restore them to normal contour and condition, by trimming, regulating or filling in such manner as to render them serviceable in all respects for eating upon, speaking and completion of natural expression. To do all this, has been, heretofore, in the power of but the very few, if indeed it has been in that of any.

A combination of noble metals with tin has been discovered and perfected by which results heretofore unattainable can be had, in a very feasible way and in short space of time, by following out the steps of the process just referred to, which has been laboriously experimented upon and proved in so demonstrable a manner as only needs to be seen to be approved by the earnest and intelligent practitioner of the art of supplying artificial substitutes for lost parts of the masticatory apparatus. Completeness of organization is necessary to completeness of the performance of function, and therefore the more nearly we can approach the perfection of the masticatory organs, the nearer we come to perfect digestion of the food upon which we live. When we shall have learned that evil usually comes upon us in

such small instalments as not to arouse attention to its insidious attacks, we can better appreciate the importance of vigilant scrutiny of our bodily, mental and moral condition, thus fitting ourselves for caring for our own soundness and that of those whom we are called upon to serve in professional capacity.

The one paramount question respecting substitution of artificial fixtures for natural structures, is concerning the character of the healed, or scar-tissue, which must be obtained, upon which or against which the artificial appliances are to rest. This is the department above all others of which little is known. The differences between the reproduction of tissues in normal nutrient activity and that resultant upon reparation from traumatic or functional lesions, has not been exhaustively studied. Yet every physician, surgeon and dentist acts upon the assumption of knowing just what to do in the cases he treats.

First apprehension of truth is usually superficial, and if taken as a complete presentment thereof, is false and misleading. Want of knowledge of the healing process led to waiting for absorption of the variable portions of the maxillary arches before inserting artificial substitutes for teeth.

If there be one wide-spread and mischievous heresy in the practice of dentistry, more to be deplored than any other, it is this almost universal habit of extracting teeth and roots of teeth, and not immediately supplying artificial means of restoration of the masticatory apparatus.

Whenever it is decided that one or more teeth must be removed, the first thing to do is to take an accurate impression of the parts, and from this prepare the substitute ready for insertion immediately after the extraction has been performed. By doing so, the patient and friends do not miss the teeth removed, neither do the tissues appreciate the loss to the extent they do when waiting for absorption is adopted, which is so generally advised.

To justify this doctrine and practice to those who plod along in the old way, it is necessary to prepare them for its acceptance by instruction through directing their attention to the erudite study of production, support and destruction of the bodies and processes through whose activities we learn the functions of Life.

EDITORIAL.

RAMBLINGS AMONG THE JOURNALS.

In the *Ohio State Journal* of January, 1883, Dr. L. G. Noel criticised an article written in 1878. Rather late! Dr. Noel speaks as if Dr. Atkinson had denied the power of ptyalin to transform starch into sugar, and of course easily slays him, while we can only read that Dr. Atkinson asserted that the transformation of albuminoids into peptones does not take place in the mouth—in our opinion, justly. Dr. Noel knocks down a self-created phantom.

In an immense editorial, Dr. Watt himself fights the new and powerful foe of his chemical theory of decay—the so-called germ theory of decay. If Dr. Watt only had a little less inclination for making fun, which is not scientific, and would stick more to the points claimed and explained, we would like much more to dispute with him. As the whole profession, and the business of the whole profession turns about this small point, we cannot say too much about it. To criticise the whole article is impossible. Dr. Watt always comes back to his classification of decay into black decay, white decay, etc. Now, black decay, as it may be termed, is so rarely the subject of treatment and investigation, compared with the vastly more common white decay, that when speaking of decay simply, all writers mean the rapid variety which furnishes certainly ninety per cent. of all the business of all dentists. Dr. Watt is very fond of speaking of acids "in the nascent state." It is a fine word for the non-adept, and we have met with many a good dentist who wished us to explain carefully the meaning of the word. It seems to us that Dr. Watt oxidizes his favorite, ammonia, altogether too easily by "nascent and quiescent oxygen" into nitric acid. We know that this occurs, but the numerous experiments with decaying albuminoids and lime-salts, or teeth, and oxygen, have shown the amount of nitric acid or rather nitrates formed as not in any proportion to the amount of ammonia generated. Has Dr. Watt ever decalcified a tooth by exposing it to the action of decaying matter in which no demonstrable organic acid was formed, and germs were excluded? While it is perfectly true that saltpeter is made in many countries by mixing common lime and ashes with urinous fluids, and letting them stand for a long time under the influence of the atmosphere, the process is very different in teeth; and while the

possibility of the formation of a certain amount of nitrate of lime is probable, at the outside of a decaying mass where the influences of oxygen and perhaps even ozone are powerful, the process of the progress of decay under a layer of half disorganized organic substances protected against the oxygen from without, etc., is not well referable to that oxidizing influence. Besides, we are not acquainted with results proving the actual formation of nitrates in decaying teeth. The proving of a possibility does not prove a fact, and a theory cannot be based on a possibility, but must be based on a fact. If we put teeth in hydrochloric acid, and they are dissolved, Dr. Watt asserts that the acid is "quiescent." How does the acid know that it is "quiescent?" Simply because Dr. Watt uses that really beautiful word; we cannot associate any idea whatever with the word. The acid always attacks most actively the tooth, just as lively as if it was nascent, or evanescent, or opalescent. Such words do not prove or disprove any thing. Dr. Watt found great fault with the statement that "acids alone do not destroy living tissue," and thinks sulphuric acid, etc., do destroy it. Surely they may, but they may not, too. Dr. Watt himself is too familiar with the many prescriptions of diluted nitro-muriatic acid in diseases of the liver, of diluted sulphuric acid in hemorrhages, etc. They do not destroy the tissue. This depends on two conditions: nature of acid and concentration, both of equal value.

As the New England Journal of Dentistry has taken a most decided ground in that question and does not care to foster a pet theory but to try, if we are able, to prove one theory by giving it our full and warmest support, we are ready and have to meet all the possible objections. Let us have no misunderstanding about our standpoint. What does it matter to an outsider, like Prof. Mayr, whether teeth decay by acids or germs? or how does a wrong theory help practical men? No one of us has the slightest interest in maintaining a wrong theory. We are as honest in searching for the truth as Dr. Watt; but only by giving a certain theory all the support possible, and fighting the objections line for line, will it be possible to determine the truth. If we are beaten no harm is done; only good comes from it; we will approach nearer the truth. By half accepting one theory, half another, and not knowing or understanding either, no good will be done. Let one consistent theory be put up, let us fight for it with all our power, and, when beaten, accept another consistent theory. But let us not float about in haughty indolence, indifference and ignorance. A theory will be needed to give a guidance in treatment, to give us the

satisfaction that we are more than men who plug up holes in teeth with gold, etc. If we have nothing to answer our inquiring patients but an indolent "I do not know," we will not stand very high in their estimation, and in that of our fellow workers in other branches of the medical sciences. We like Dr. Watt and his theories and statements much better than all the guarded statements of "lions" in dentistry, who think their real or imaginary dignity suffers, if they commit themselves to a theory. We generally can see what he has to say. He does not often talk cheap commonplace.

The experiments of Dr. Uskoff are arrayed against the theory of germ diseases. But Dr. Uskoff's experiments only prove that *suppuration* is not due to the presence of germs; but suppuration is nothing but a transformation of the tissues of the bodies into their embryonal state, and no germ affection, as it has been proved almost conclusively by the followers of Dr. Carl Heitzmann in his excellent book. Between suppuration of tissues and necrosis of tissues there is the same difference as between croup and diphtheria, which, though resembling each other very much in their macroscopical aspects, are due to entirely different causes, and are very different in their clinical features. Without doubting for a moment the ability of Dr. Uskoff, it is simply again one of the cases that "do not apply." Dr. Watt must have odd ideas of microscopic organisms, if he says that "though not claiming to be an expert with the microscope, he could see a June-bug or a beetle if in full view." With that "if," Doctor, you never will see a microscopic organism, if you want to see them as large as these insects. While the experiments of Dr. Watt and Prof. Wood will never be questioned, they prove but very little.

The greater part of the dabs of Dr. Watt at some of our editors we can pass over in silence; they belong to the funniness to which unfortunately now and then Dr. Watt yields too much. We repeat again, what was said in one of our former numbers, not the years of work are the point in question, but who is right or wrong. That young sprig, Napoleon I., not more than 26 years old, drove before himself, with his ragged army, men with forty years of study in the military sciences. Dr. Watt gives an excellent specimen of his logic in the following passage:

"Now, for the present, assume (!!?) that white decay is immediately caused by nitric acid, and that this acid is formed by the oxidation of ammonia. As ammonia is composed of nitrogen and hydrogen, its oxidation results in nitric acid and water. Liebig and other author-

ities state that it is always thus oxidized in the presence of free oxygen. And if it was in Liebig's day, it is now. Remember, too, that ammonia always results from the putrefaction of nitrogenous organic compounds. Suppose an atom of nitric acid has got through the enamel—not through the hole that Mayr's bug goes in at—but through a defective spot. It acts on the dentine—faster on the lime than on the gelatin. A thin layer of the lime-salts is dissolved, and of course, a thin layer of organic matter is left. By putrefaction it gives ammonia, to be oxidized into nitric acid, to dissolve more lime, and expose more organic matter, to putrefy and give more ammonia, to be oxidized into more nitric acid, to dissolve more lime-salts,—and thus, on and on, till the pulp cavity is reached. Such is white decay."

There is hardly a sentence that is not full of chemical sophistry, suppositions, hypotheses and things that do not apply. Dr. Watt leads the "calm, old President of a Theological Seminary," that real handy person, against modern science in general, in the following passage:

"A President of a Theological Seminary was asked by a somewhat alarmed pupil if he thought that Christianity could stand up against the present teachings of science. The calm old President asked: 'What are the present teachings of science? I have not read the dailies this morning.'"

The pupil asked a silly question, no joke about that, but the man who gave that answer was either a consummate ass or one of those haughty, ignorant, self-made demi-gods who fancy themselves to stand between God and the human rabble. If he expected to see real science in the "dailies of the morning," he never knew what science was; they would not print it, because it would be too dull to the great mass of the readers. What they print are speculations; the better, the more startling or improbable, and it is a very common sophistry among pious ostriches who wish to keep their heads in the sand, to lament about the changeability of science, while they never yet knew what it was or claims to be. Because they will tell you, in a few minutes, to their own satisfaction, the whole receipt of their creed in childlike, bland words and dreamy parables and comparisons, they are unable to realize the depth of real science, which fills a man's deepest soul with a lasting, never-fickle love of truth rather than of the happiness of people afflicted with progressive paralysis. We hope to hear less of the wondrous sayings of that "calm old President." Dr. Watt in his worst, when talking about ammonia being oxidized into the nitric acid in the mouth, says much better things than he.

The *Ohio State Journal* for January, 1883, contains as first article the very good paper of Dr. T. W. Brophy, of Chicago, on caries and necrosis of the bone. He does not go into deep theoretical speculations, but shows from cases illustrated that, for carious bone, the only treatment with any success was to scrape off the affected portion of bone, while in necrosis the only help was to let the sequestrum be formed completely, and then to remove it mechanically.

In an elaborate article, Dr. G. V. Black, of Jacksonville, Illinois, speaks of phagedaena pericementi. The paper was written in consequence of an invitation to write about Riggs' diseases. He says: "My notions of this disease have long been at variance with those held by the profession." He attempts to prove that the chronic destructive diseases of the alveolar dental membrane is not always dependent upon calcareous deposits for its origin, and distinguishes between cases which arise from the presence of salivary calculus, and others, similar to the first in other respects, which do not arise from this source. This second form of the disease he calls phagedaena pericementi, or phagedaenic pericementitis. He considers this disease an infectious chronic destructive inflammation of the alveolar dental membrane, by which that part is destroyed, cell by cell, fiber by fiber, similar to the process of caries. No considerable inflammation of the gums is necessary; in the simpler forms the disease is strictly limited to the alveolar dental membrane, beginning at its gingival margin; first, a red line appears at the borders of the gums. The author thinks this line a constant first symptom, which disappears, as the disease advances. After the red line has persisted for some time, close examination will discover that the margin of the membrane is decayed, so that a thin flat blade will pass down the root farther than it should do. The destructive process gradually extends towards the apex of the root, forming in most cases narrow, deep pockets. This may occur at only a few points around the root. If the disease attacks only one side of the membrane, the position of the tooth will be altered; it will move away from the diseased parts. In many cases the gums do not recede from the teeth at all, as in the case of calcareous deposits. In a number of cases Dr. Black has observed a distinct thickening of the gingival margin of the alveolar process in the early stages of the disease, which he thinks to be due to a bony deposit. In many cases with gums apparently perfectly healthy, the disease seems to be more rapid and destructive than the one accompanied with the deposit of calculus. Though cases without calculus are quite numerous, the greater

number of cases has been accompanied by calcareous deposits. The calculus deposited from the serum of the body, he calls "serumal calculus," forming the incrustations on foreign substances imbedded in the body. To distinguish the purely phagedaenic pericementitis from the destructive affection produced by calculus, the author thinks the pockets and presence of a fungus as indicating the first, and not the latter. He considers the fungus found in the pockets as pathological, and that the disease therefore is infectious. A transportation from mouth to mouth by the instruments of the dentists, he thinks probable. He considers it curable, though with difficulty. If the infectious character of the disease is true, it would add another one to the list of the numerous "germ diseases" with which dentists have to deal.

The action of the Brooklyn Dental Society in taking up the subject of the "Etiology of Dental Caries," and devoting a series of monthly meetings to its consideration, seems to us a wise one. Having made the "germ" theory the subject of investigation for the two previous meetings, we understand that at the next, which occurs on the 12th of February, they take up the "chemical" view, as presented by Dr. Watt in the January number of the Ohio State Journal. No more important subject can engross the attention of the whole dental profession than that which relates to the *causes* of that which the profession are endeavoring to alleviate and prevent. How can "treatment" be intelligent that is based upon an incorrect or superficial diagnosis or theory of causes and conditions? The degree of *exactness* in the apprehension of facts constitutes the difference between the scientific and empirical. A whole winter may be well spent by the Brooklyn Society, or any other, in the study of this question; and it must be studied from all sides in order to arrive at an impartial and other than narrow view or theory. In the study of this question there is much *sifting* necessary in order to separate *theories* from *facts*—the "*Maybes*" from *what is*. In this regard we are aided very greatly by the investigations of our reliable microscopists and chemists. Facts from these two scientific sources go a great ways towards the establishing of a reasonable theory, especially when the revelations from each harmonize so thoroughly as they do, and, also, with the common observation of every day practice. It is these *facts* that we need to seek out and firmly fix in the mind; after this is done *theories* will follow necessarily with every intelligent, philosophical mind. What

we need to be most careful about is the *facts*—and in the search for these we must lay aside all bias and preference, that may easily be misleading. We trust the example of the Brooklyn Society may become contagious.

Dr. Marshall Hickman Webb died January 1, 1883, at 5 A. M., at his home in Lancaster, Pa., of cancer of the colon, from which he had suffered terribly, at times, for two years previous to his death. He was born at Marlsborough, Chester County, Pa., October 28, 1844, making him 38 years of age. He studied dentistry with Dr. Frank Hickman, of Coatesville, Pa., and was graduated by the Philadelphia Dental College in 1867, and has practiced in Lancaster ever since, where his great skill in operative dentistry and his thorough knowledge of surgery soon gained for him a very extensive practice, and brought his name prominently before members of the dental profession. He was a member of the Harris Dental Association of Lancaster County; of the State Dental Association (Pa.), and the American Dental Association. He held the position of Lecturer on Operative Dentistry and Dental Histology in the Dental Department of the University of Pennsylvania. He attended the International Medical Congress held in London, 1881, before which body he read a very able paper upon "The Restoration of Contour the only way to Keep the Margins of Proximate Surfaces of the Teeth Permanently Separate and Prevent Recurrence of Decay." He also gave demonstrations of his very superior skill in operating, using the electric mallet, the construction of which he had improved very materially by inventions of his own. Among his professional brethren he was regarded as one of the brightest and most thoroughly scientific members of the profession. Although wasting with a painful disease, Dr. Webb still had the elevation of the standard of dental operations at heart, and while confined to his bed wrote a work on operative dentistry, which is now in press, and shortly to be published, by The S. S. White Dental Manufacturing Co., which will be an enduring monument to the memory of this superior man. Dr. Webb leaves a wife and three children and our whole profession to mourn his untimely death.

"Cohn estimates that one bacterial rod, under favorable circumstances, will produce 281,500,000,000 in forty-eight hours; and that, were it not for the unfavorable circumstances incident to its situation, it would fill the ocean in five days."—*Popular Science Monthly.*

It was once the misfortune of an old Irishman whom we knew, to be brought before the police court, charged with some slight misdemeanor. After the indictment had been read to him with all due legal formalities and solemnities, he was called upon to "plead," which he did in this somewhat unique manner: "Well, your Honor, I am guilty some, but not as guilty as that paper reads." This pleading of the honest old Irishman we feel like appropriating regarding the late delivery of our January number of the Journal. We were several days later than usual in mailing this number, but several days thereafter we ascertained that they had not been distributed and sent on their way by the insufficient force at our local Post Office. We were "guilty some," but not as guilty as the lateness of their arrival at various destinations might indicate. While the country might be benefited to some extent by a reduction in letter postage to two cents, it would seem that there are some offices, at least, that would be benefited were the department to accord a larger force to cope with the increasing demands of business. We suspect, by the way, that our local office is not alone at fault in this respect, as most of our exchanges came to hand after our number was mailed. Holiday packages would probably be the assigned reason for this delay at "headquarters," but if the government assumes this merchandise mail carriage business, it would seem that their facilities should be made equal to their undertaking, so as not to interfere with the more legitimate and regular business of the department. To be fair, however, we will say that we have not had occasion to find fault before.

Those who have had the pleasure of meeting the late Dr. Webb, and the larger number who never saw him, but have nevertheless felt the influence of his noble devotion and disinterested services in behalf of the profession, will be saddened by the intelligence that *because* of this devotion and service, he has left his family, a widow and three children, unprovided for. Every one who knew him must admit that had he been less unselfish and had he given less of his time and strength to the general good of the profession, he might have left a competence to his now bereaved family if, even, he might not have saved his life for years yet to come.

We refer to this because a testimonial fund has been proposed by several dentists who feel their obligation to him, and have voluntarily expressed a desire to contribute generously to such an object.

Arrangements have been made whereby Dr. J. W. White, editor of the Dental Cosmos, will act as treasurer and gladly receive and acknowledge any subscriptions which may be sent as a token of sympathy with the family and appreciation of Dr. Webb's valuable and unselfish work. The mere announcement of this project ought to be enough to insure a large fund. How much do you *owe* Dr. Webb?

The editor of the Journal of the British Dental Association has kindly sent us advance sheets of a very valuable paper by C. S. Tomes, M. R. Ç. S., F. R. S., etc. Subject, "On Some Scientific Problems of Dental Surgery," read at the late annual general meeting of the British Dental Association.

Our space this month will not permit its production in our columns in full; consequently, we defer it until the March number.

SOCIETIES.

CONNECTICUT VALLEY DENTAL SOCIETY.

[Conclusion of Report.]

MORNING SESSION—*Second Day*, Oct. 27, 1882.

SECTION 4.—Dr. Parmele, chairman, reported the following cases:

CASE OF NECROSIS.

Johnnie F., of Irish parentage, and of scrofulous diathesis, about five years of age, was brought to me by his mother, who desired me to extract the right inferior second molar to relieve pain which he referred to that tooth. Examinaticn with a mirror showed the surrounding parts congested and highly offensive, but the tooth complained of was so slightly attacked by caries as to show at a glance that it was not the cause of the trouble. Traction upon it, however, showed it and a portion of the adjoining bone quite loose and free from the maxilla. After making a slight incision, I was able to gently lift out the exfoliated portion, which I pass around for your inspection. It will be observed that the germs of the permanent bicuspids are in the sequestrum, but on examination of the boy's mouth at the present time (it being now about seven years since I first saw him), shows the permanent canine also missing, the germ of which occupied

the space where the most active inflammation seems to have been. Owing to ignorance of the mother, the history of the case is rather meager, she not being aware of any trouble until a day or two before calling on me. I am inclined to think, however, that the trouble resulted from a blow which the boy says he received about a year before. The only after-treatment required was thorough cleansing with carbolized water, the parts healing quickly.

EPULO-FIBROID TUMOR.

Miss De S——, aged 20, was referred to me Feb. 6th, 1877, on account of an epulo-fibroid tumor of the right superior maxilla. Her family dentist who, by the way, is quite skillful as regards the purely mechanical part of dental treatment, had no idea what it could be. The upper lip was considerably protruded. Examination of the mouth showed a tumor slightly pediculated, five-eighths of an inch in diameter, attached by a broad base half an inch above the margin of the gum, over right superior incisors, and having a granulated surface. This tumor was first noticed about a year before, and had since gradually increased in size. A casual glance at the incisors revealed nothing abnormal, but careful examination showed a slight darkening of the left central. This tooth, the patient stated, had never to her knowledge been treated as far as the pulp cavity was concerned, but when an attempt was made to excavate on its distal surface two or three years before for a small filling, it was so sensitive that the dentist said he would put in something to make it less so. A few days later it was painlessly excavated and filled, since which time she had experienced no pain. Pressure over all the incisors caused pain. I advised opening from its palatal surface into the pulp cavity, which, being done. a large quantity of offensive pus was liberated. With a small probe I discovered a free opening through the root. Thoroughly washing out the parts and making antiseptic applications, I dismissed the patient for a week, when the tumor was to be removed.

Feb. 16. Ether having been administered by an assistant, I thoroughly removed the tumor by an elliptical incision carried well back into healthy tissue. Finding the exposed bone carious from this point over to the left central, it was deemed advisable to extract that tooth, which was done, and all carious bone removed. Through cleanliness obtained by the use of a solution of carbolic acid, gtt. x to ℥i of water, and a week's time, completed the cure. Six months ago there had been no reappearance of the growth, although at times,

from uneasy sensations in the parts, the patient feared there might be. I have regretted the loss of the tooth, and have often questioned whether, in a similar case, I should extract; but, taking everything into consideration, I consider it the safer course. Garretson* says of these tumors:

"By treating them with the latitude given to carcinoma, nothing detrimental to an innocent growth is done, but everything in the way of cure possible (with our present knowledge), should the disease be malignant."

At any rate, here is the tooth for your inspection. This case illustrates two points which all reputable dentists are supposed to know:

1. That arsenical paste is not a safe application for sensitive dentine. (I take it for granted that arsenic was applied, although I can not assert its use.)

2. That in order to be a competent practitioner of *dental art, even,* something more than a mere mechanical knowledge is necessary.

PERIODONTAL ABSCESS INVOLVING THE ANTRUM.

Mrs. C. W. H., aged 50, was referred to me, Sept., 1881, by Dr. C., for treatment. I found the left superior canine with its crown missing, and the root loose from chronic periodontitis. The bicuspid and first molar were missing, and half an inch above the margin of the gum, at a point formerly occupied by the second bicuspid, a fistulous opening was discovered which, upon probing, was found to lead to the antrum. Removal of the canine root was followed by a slight discharge of pus, and a probe passed into its socket also entered the antrum. Surrounding each of these openings was carious bone—greater in amount, however, at the canine opening, where the maxilla was dissolved away for a space half an inch in diameter. Having thoroughly removed all diseased bone with bone-cutting burs in the dental engine, I then, by means of a small tube attached to a fountain syringe, allowed about a pint of warm salt water to flow into the antrum at the anterior opening, which made its exit at the posterior opening. By changing the tube to the posterior opening, I reversed the current, thus insuring thorough cleansing of the sinus. This was followed by this injection:

℞. Eucalypti (Sander's Sons), ʒi;
Iodeformi, gr. x;
Aquæ, ℥i.
M.

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* Page 812; third edition.

And a tent of candle-wicking, saturated with glycerine and eucalyptus, was passed into the antrum at the anterior and brought out at the posterior opening, where the two ends were tied together. A few days later, floss silk was substituted for the wicking. This treatment continued a week, when the tent was omitted, and the patient being instructed, from that time kept the parts clean herself. In a month after, a few stimulating injections:

℞. Zinci sulphatis, gr. iii;
Rumbi acetatis, gr. v;
Tincturæ catechue, gtt. x;
Aquæ, ℥i.
M.

The parts had regained their normal condition, and the openings gradually healed.

The cause of this trouble seems to have been an abscess on the root of the canine tooth, which had worked its way into the antrum and given trouble more or less for about five years. At one time an abscess had pointed, and was opened where I found the fistula above the site of the second bicuspid.

The use of the fountain syringe for thorough cleansing of the antrum I find very useful. I have never seen its use for this purpose mentioned; nevertheless, it may be an old idea, though new to me. It certainly cleanses the antrum thoroughly and is more easily managed, either by operator or patient, than any other form of syringe.

Discussion.—Dr. Shepard wished that Dr. Parmele would speak more at length upon the use of eucalyptus.

Dr. Parmele: I generally use an extract of the leaf, prepared by Sanders & Son, of Australia. I do n't use iodoform much, dissolved in ether. When I do, I add it to eucalyptus, and let the ether evaporate. I use eucalyptus in the treatment of devitalized teeth, and just as I get it—full strength—excepting where it is to be used as an injection. Then I dilute it.

Dr. Atkinson: My experience has been similar. I had a young man, who was a great smoker, come to me with an abscess of the root of one of his centrals. I used it full strength through a sinus, and a slough resulted. I had supposed that eucalyptus was not an escharotic, but in this case it might have acted deeper, owing to debility from nicotin.

Drs. Shepard, Abbott and Bartholomew related experiences with and treatment of cases of abscess and necrosis, Drs. Searle, Miller

and Niles participating in the discussion. Following this, Dr. Shepard exhibited methods of preparing and holding sand-paper disks. The ingenious device for holding them ready to hand for use, and the remarks of the doctor upon their very general application in the treatment of decay, was greatly appreciated.

Section 5—Paper by Dr. Atkinson (found elsewhere in this number). Owing to the lateness of the hour, this paper was not fully discussed.

Dr. Shepard spoke in praise of Dr. Heitzmann's "Microscopical Morphology," Tyndall's "Floating Matter in the Air," etc.

After President Morgan had been duly installed, and had thanked the assembly in a few well-chosen words for the honor conferred, he appointed the following committees:

Executive Committee.—Drs. S. B. Bartholomew, Geo. M. Parmele, A. J. Nims.

Section Committees.—1, S. E. Davenport; 2, C. T. Stockwell; 3, E. S. Niles; 4, L. D. Shepard; 5, C. F. Bliven.

Dr. Frank Abbott was elected to honorary membership.

Voted, That the place of next meeting be selected at the discretion of the Executive Committee.

Adjourned.

SELECTIONS.

In our May (1882) number, we published an article that was read before the International Medical Congress, by Arthur S. Underwood, M. R. C. S., L. D. S., and W. J. Milles, F. R. C. S., on "An Investigation into the Effects of Organisms upon the Teeth and Alveolar Portions of the Jaw." In the November number, Dr. Stockwell also made quite extensive extracts from the same article. The *subject* of this paper being, seemingly, the *live* question of the day, we have thought it advisable to quote from the official report of the Congress the discussion in full that followed the reading of this interesting report by the above-named gentlemen. The italics are our own.

Dr. Taft, Cincinnati: The experiments detailed in the paper just read are very interesting indeed, and are fraught with instruction for all; but they can hardly be regarded as accounting for the production of caries of the teeth. The conditions that attend and surround the

teeth in the mouth cannot be simulated nor imitated artificially. The experiments here given were conducted under a uniformity of conditions that is never found, and does not exist. The temperature in the mouth is ever varying; the substances in the mouth are changing constantly and the agents produced by their decomposition or fermentation will be various, and subject to constant change. The agents producing decay are subject to change, both in kind and degree. In the mouth there are ever present substances that will produce coloration, more or less marked, and various in kind. In regard to parasites, I do regard them as active agents in dental caries, and not a cause, but a result, of decay; they are not a primary, but a secondary element in the process. The cause of dental decay must be sought in some other direction, of which I will not speak.

Dr. Dentz, Utrecht: It appears to me that the experiments carried out by Messrs. Underwood and Milles, although exceedingly interesting, nevertheless lead to results identical with those obtained by Leber and Rottenstein, whose conclusions have already been sufficiently controverted by, amongst others, Messrs. Wedl and Tomes.

Mr. C. S. Tomes, London: In answer to the suggestion that the paper before us has been anticipated by older writers, and that it is inconclusive, I may be permitted to point out wherein it appears to me that the especial value and the thorough originality of the paper lies. Caries has been produced artificially many times, and by many observers, but with no special thought of septic agencies taking any part in the process; consequently, they have always had their full fling. Mr. Underwood and Mr. Milles have shown, by many experiments, *that the other conditions remaining precisely the same, in an aseptic flask caries never occurs; in a septic flask, it always and speedily occurs.* Whatever interpretation we may put upon this, it remains as a fact, contributed to our knowledge of the artificial production of dental caries, which can never be left out of consideration by any subsequent observer or writer on the subject.

Mr. Walter Coffin, London, described a treatment of extensive alveolar abscess by the evolution of oxygen rapidly, within the sac, by the injection into it of peroxide of hydrogen, forming with the secretion a thin froth, and strongly distending and thoroughly evacuating it. There is a complete antiseptic disinfection without coagulation.

Mr. Coleman, Streatham, said that the interesting and valuable paper they had just listened to was—whether it should lead to the adoption of the views of the writers or the rejection of their opinions

—still a step, and a valuable step, towards our knowledge of the conditions or complications which are to be met with in the affection termed dental caries. There was this difference, that in the one case —in the mouth—the affection occurred in structures closely connected with living tissues, which was not the case in the artificial experiments. Mr. Coleman further said it would be very interesting could they follow out the ultimate results of abscess cured by antiseptics. He had thought the matter much over, and considered it probable that the part so treated might assume the condition of the carbolized catgut. If so, it was more than probable they would undergo the same changes as the latter did when introduced into the body, viz.: to become gradually absorbed, and have their exact place supplied by new and healthy tissues.

Mr. S. I. Hutchinson, London, thanked Mr. A. Underwood and Mr. Milles for their most valuable labors, and believed they had got in the right groove for elucidating the action and cause of caries; but he must protest against the threatened abandonment of the term "dental tubules." The authors admitted that there were fibrils, that these fibrils ran in channels in the calcified tissue of the dentine; then, why should they be so ready to give up calling those channels, tubes? Mr. Hutchinson then read an extract from Dr. George Harley's paper in the Pathology Section, which went far to confirm the authors in their views. He says that "all disease germs tend to produce local as well as constitutional disturbances."

The debate was continued by Mr. Spence Bate, Plymouth.

Mr. A. S. Underwood, London: I have very little to add to Mr. Charles Tomes' speech, by way of reply. He has expressed my idea of the scope of my paper more clearly than I could have done myself. Dr. Taft has asserted that germs *are not primary*, but *secondary*, causes of caries; this assertion I must meet by simply saying that *they are never secondary, but always primary*. One assertion carries probably as much weight as another. Both Dr. Taft and Dr. Atkinson have misunderstood the drift and scope of my paper. We did not profess in the short space of twenty minutes to give a succinct account of the ultimate and elementary causation of everything connected with the teeth. The allotted time is scarcely sufficient to discuss the effects of germs, and we had no desire to enter into any other questions. Dr. Taft must remember that the varieties of caries are just what we should expect from the varieties of the germs, hundreds of different forms having been already demonstrated. Dr. Atkinson asks me what "sep-

ticism" means. In England, we understand it to mean a condition in which germs are present. He also complains of the use of the terms organic and inorganic. I can only say that we are obliged to employ these terms in their ordinary sense for simplicity's sake. Mr. Hutchinson asks an important question, afterwards repeated by Mr. Spence Bate, why are bacteria more lively now than two thousand years ago, when decay was less rife? I answer that we are all more lively ourselves; we eat things and drink things that are not good for our enamel, and we contract diseases, traceable to civilization, that are not good for the enamel of our children, *and thereby give the bacteria an opportunity to employ their energies on the weak points.* Our progenitors ate simpler food and lived more simply, and therefore their enamel was better, and the progenitors of the modern bacteria had no chance of showing what mischief they could do. The primeval micrococci that dwelt in Mr. Bate's primeval skull were as powerful as those that swarm in the mouth of a modern dog (and even dogs are beginning to have decay now). I must heartily thank Mr. Bate for his clear and candid criticism. I hope he will investigate what we have said; we shall do so ourselves. We do not take it for granted or blindly believe it a bit more than you do, and if our further researches disprove it we shall be the first to say so. We quite feel, with Mr. Bate, that it would have been more satisfactory to have enlarged at greater length upon our experiments; but there is plenty of time before us for that, and we promise to do so. Do not expect too much all at once; we had an embryonic theory, and as you had a Congress, we determined to broach it to you. Of course, time alone can establish it, but we cannot give you a new theory, and, at the same moment, one sanctioned by time. Our bantling is in his cradle; we must wait to see what he will grow up to be. Dr. Dentz has also paid us a compliment I cannot pass over, in coupling our names with those of his distinguished countrymen, Leber and Rottenstein. I must, lastly, thank Mr. Charles Tomes for his clear exposition of our views. I do not think you have heard the last of them, and I confess to a suspicion that our endeavors to convince our very candid critic, Mr. Spence Bate, will be crowned with success; and I am sure that if we can prove our point to his satisfaction, he will be the first to confess the fact. One thing I think you will all agree upon, that, whatever the merits of the paper, it has produced a very animated discussion, for which, in the name of my colleague, Mr. Milles, and myself, I heartily thank you.

BIBLIOGRAPHICAL.

Caries and Necrosis of the Maxillary Bones. By Truman W. Brophy, M. D., D. D. S. A paper read before the Illinois State Dental Society.

The following "*Resume*" will give a general idea of this valuable paper, for which the author has our thanks:

"To avoid the diseases described, first, always remove loose, valueless roots that cannot be made useful by crowning. Second, always avoid the use of cotton or other material in the filling of roots which will absorb moisture, or admit fluids within the canals, since from these fluids emanate the gases which cause the inflammations that most frequently lead to diseases of the bones hitherto described. Third, never remove a tooth or root, even though the apex is standing up in the carious bony cavity, provided the periosteum intervening the carious cavity and the alveolar border be not dead. This exposed point of the root may be excised, the pulp canal filled, the carious bone removed, and the tooth restored to usefulness. When chronic alveolar abscesses do not yield readily to the iodine or carbolic acid treatment, caries, although perhaps slight, very likely exists, and the sulphuric acid treatment should be resorted to. When patients suffering from acute periostitis of the maxillary bones present themselves to us, we should unhesitatingly, and without delay, make numerous and deep incisions down upon the bone and relieve the engorged blood vessels."

Diagram of an Incisor Tooth. Mailed in paste-board roll to any address. Price $1.00. The S. S. White Dental Manufacturing Co.

This beautiful illustration of the minute structure of an Upper Central Incisor was published under the direct supervision of Professor Frank Abbott, M. D., and by special request of the Dental Society of the State of New York. The object was to give to the dental profession a correct idea of the minute anatomy of a tooth. If not absolutely perfect microscopically, it approximates so closely to nature that it conveys to the mind at once an intelligent understanding of the structure and relations of the organ. The diagram represents a longitudinal section of the tooth. It is 13½ by 9½ inches in size, and is printed in six colors. It shows, clearly, Nasmyth's membrane; the enamel, dentine, cementum aud pulp, with periosteum and socket of

alveolar process, covered by the gum; the blood-vessels and nerves of the pulp; the odontoblasts surrounding the pulp; the direct connection of the non-medullated nerve-fibers with the odontoblasts, and the passing of those fibers between these bodies into the dentinal canaliculi, and the distribution of living matter in almost every direction throughout the dentine, finally reaching the interzonal layer (interglobular space); whence it enters the enamel, to which it is more minutely but as clearly distributed.

We are indebted to Dr. J. A. Robinson, of Jackson, Mich., for several valuable publications, among which are the Transactions of the Ohio State Dental Society for 1881, and the Michigan Dental Society for 1882. Dr. Robinson will please accept our thanks. These reports are especially valuable to editors of dental literature.

CORRESPONDENCE.

Salts of metals prevent decay of dentos.

Dr. F. Y. Clark, whom the Journal quotes in its January number, says: "Solutions of mercuric chloride . . destroy spores in ten minutes. Does not this solve the mystery of the old mercurial fillings inserted over forty years ago, and explain the cause of recalcification of dentures often seen under those fillings?"

The oxides of metals preserve wood from decay. They preserve dentos from decay.

In the January number of the Journal are extracts from Dr. Miller's paper on "Electrical Currents in the Mouth." He says: "I maintain that there exist electrical currents in the mouth, but not between filling and tooth substance." "The conductive power of dry dentine was tested . . not the slightest passage of electricity could be noticed." "When the dentine was moist the moisture conducted the current."

I say, is not the dentine of a tooth in the mouth always moist? Then, what is to prevent the electric current between dentos and metal, unless it is cut off by a non-conductor? Are there not thousands of open end tubes next to every large filling? Are not these tubes filled with moisture? Is not the enamel itself moist?

Henry S. Chase, St. Louis, Mo.

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ORIGINAL COMMUNICATIONS.

ON SOME SCIENTIFIC PROBLEMS OF DENTAL SURGERY.

BY C. S. TOMES, M. R. C. S., AND L. D. S., ENG., F. R. S., ETC.

Read at the Annual General Meeting of the British Dental Association, at Liverpool, August 25, 1882.

It is a reproach of long standing that the method and practice of medicine are unscientific, and that they are merely empirical, whilst the practitioners of medicine in the early days of the separation between medicine proper and surgery in their turn looked down upon the surgeons as even less scientific than themselves. It was not long before the surgeons made such strides in their art that they could claim full equality with the physician, as rendering useful service to their patients; but, more particularly where handicraft forms an important element in treatment, there long lingered a tendency to draw a distinction between the so-called "practical" and the "scientific" man, to the detriment of the latter. Other and far abler pens than mine have demonstrated the fallacy which underlies such distinctions by pointing out that "scientific" knowledge differs from any other knowledge in no respect but in that a rigorous accuracy of fact is demanded, and vague beliefs incapable of proofs are rejected; so that to say a word against science in our practice is simply to plead the advantages of ignorance.

The immense triumphs which have been achieved by modern surgery, triumphs which are being added to every day, are the outcome of the pursuit of more rigorously scientific methods, and if we in our specialty of dental surgery would advance likewise, we can only hope to do so by following a similar course. So much I have said by way of prelude, in order to remove any impression that might exist that "scientific problems" lead to no practical result. And I am sorry to say that a review of recent dental literature brings sadly into prominence the lack of true scientific spirit amongst our workers; it is voluminous enough, it is positive enough, but the voluminousness and the positiveness alike are the outcome of insufficient observation, insufficient experiment, and insufficient exactitude of thought. Take for example the discussion as to those physical qualities of gold which we term cohesiveness and non-cohesiveness, or take the much discussed questions arising out of amalgams and their defects; and of all that has been written there is not one hundredth part which is worth reading, or which can possibly carry conviction to any one's mind. It is always, "I am sure," "I have all my life known," or something to that effect, and very rarely an experiment, or statistics, or anything convincing. And when we have statistics or experiments, they are too often such as to demonstrate by internal evidence that little reliance can be placed upon them. In this depressing state of things it has seemed worth while, although having little in the way of research to communicate, to formulate exactly what we want and need to know about some of the conditions we are most often called upon to treat, namely about alveolar abscess and its causes.

Surgeons, and physicians too, are at the present time largely engaged in investigating what is termed the germ theory of disease, and this has, as you all know, a most practical bearing upon treatment. That aspect of the question which mainly concerns us may be broadly put thus; whether certain morbid conditions can and do arise within the body itself, or whether they are imported from without, in the form of germs or what not. It would be entirely out of place to here attempt to give any outline of the basis upon which antiseptic surgery rests, but it may be well to remind my hearers of some few of those experiments and observations which bear most directly upon the problem before us.

It is thoroughly well established that organic fluids or tissues, though eminently susceptible of decomposition, do not undergo putrefactive decomposition without the help of organisms, bacteria and micrococci,

which grow in them, and act apparently as ferments. If these are excluded, as they are from an aseptic flask, or are killed by boiling, as is the case of tinned meat and vegetables, no putrefaction takes place. According to Dr. Ogston, micrococci do not produce putrefaction, and flourish best when removed from the air; on the other hand, bacteria cause stinking putrefactions.

Portions of tissues cut from animals just killed and passed, with full antiseptic precautions, into an aseptic flask may be kept fresh for an unlimited time; and this leads to the inference that the germs of micrococci and bacteria do not circulate in healthy blood, and do not exist in healthy organs. But introduce a trace of dust into the flask, and the whole contents at once putrefy, whilst the putrid fluid is found to swarm with organisms. So also the discharges from a wound kept aseptic do not putrefy, and the patients do not get pyemia or septicæmia, except through the failure of the antiseptic precautions. Another most instructive experiment is being every day performed on a large scale. In the south of Europe the castration of male animals is effected by an operation termed "bistournage;" roughly speaking, this consists of twisting the testis upon the spermatic cord, so that without any exposure to external influences at all it is killed, and instead of putrefying, it withers away. This portion of tissue, killed by the severance of its vessels, is analogous to the pulp of a tooth which has been killed by a blow, to which I shall revert. But Professor Chaveau has carried this experiment farther; he has introduced bacteria into the veins of animals upon whom bistournage was about to be performed, with the result of bringing about the decomposition of the killed testis, which then became the cause of profuse suppuration; so that the proof is in this case exceedingly complete that a portion of tissue may be devitalized without decomposing and without setting up inflammation around it to any material extent so long as it is not exposed to external influences; but once introduce septic organisms into it, even by way of the circulation, and this happy result is no longer attainable.

One might multiply examples of this fact to any extent, but I will merely remind you that surgeons, in subcutaneous operations, have for years availed themselves of the immunity from subsequent ill-results afforded by the avoidance of any exposure to outside contamination. In septicæmia, micrococci may generally be detected in the blood, as they also may in several morbid conditions which do not concern us now.

It sometime ago occurred to me that we had, in the numerous cases of abscess which come before us, the opportunity of studying to considerable advantage the share which organisms take in these productions, but I have not since been able to make my observations sufficiently numerous to draw any general principles from them. So far as I know there is no literature on the subject of the connection of organisms with dental abscess, with the exception of allusions to alveolar abscess in a report by Dr. Ogston (British Medical Journal, March, 1881). He found micrococci and bacteria in the pus from alveolar abscesses; and generally speaking, he found organisms in the pus of all acute abscesses which he examined, but did not find them in that of "cold" abscesses. We are not told in his paper of what nature the alveolar abscesses examined were, whether acute or chronic. Amongst the many important results in Dr. Ogston's report, which will repay the most careful study, is this: that injection into animals of pus which contained no micrococci produced no result, but that of pus containing micrococci, or of micrococci artificially cultivated, always produced abscess, though if thoroughly carbolized it did not do so.

The pulp chamber of a tooth is a cavity which, prior to the occurrence of caries, is absolutely isolated from external influences, and has but one channel into it, namely, its apical foramen; even after the occurrence of caries it can be tolerably easily and completely closed. And hence it is a particularly favorable place for investigations of this nature, and, it might be hoped, would lead to results of wide application.

It has been shown by Messrs. A. Underwood and Milles that bacteria are to be found within the substance of carious dentine, and this fact remains established, whatever view may ultimately be adopted as to the extent of their influence upon the morbid process. The observation that bacteria are not to be found within healthy dentine, which, therefore, even in the absence of enamel, constitutes an efficient barrier, and that they are to be found in carious dentine, is one that has an important bearing upon the present inquiry.

For our present purpose we may consider alveolar abscess as occurring under three sets of conditions: 1. Where the pulp of a tooth has been somewhat nearly approached by caries, a filling has been inserted, and, after the lapse of an uncertain time, the tooth pulp is found to be dead and decomposed. 2. Where the pulp has been killed by a blow, with no breach in the hard tissues of the tooth.

3. Where after removal of the debris of the pulp, and filling or dressing of the roots, abscess recurs after the lapse of considerable time, and without failure of the filling.

I have placed first death of the pulp as a sequence to caries and filling of the tooth, because the problem there involved is a simple one, and also because I have more positive evidence to offer upon this set of conditions than upon the others.

I have purposely excluded all observations upon cases in which an alveolar abscess had already broken, because in these there was a communication with the exterior of the gum, through which the germs might have entered. Of cases in which I was able to open up the pulp chamber, prior to the occurrence of abscess, I have only met with six since my attention has been directed to the subject, and in every one of these six I found the offensive fluid debris to contain bacteria and micrococci. But it is not always easy to be certain whether micrococci are or are not present, as there is always a great deal of granular matter which renders their discrimination less certain than that of the rod-shaped forms. As I have before mentioned, it is not difficult to account for their presence, seeing that carious dentine affords a home for them, and that there may have even been a minute actual exposure of the pulp. But it is a question of great interest, and of practical importance, too, to discover, if possible, what share the organisms have had in provoking the inflammation of the pulp which has preceded its death, and in the subsequent changes in the way of its decomposition.

In the admirably clear lecture of Professor Burdon Sanderson on Inflammation (reported in the British Medical Journal for April, 1882), it is related as proven that in the cornea, its epithelium being damaged, an inflammation springs up which is due to the entrance of germs and their multiplication in its substance, and it is worth noting that in these exceptional cases in which the early extraction of the tooth has, for some reason or other, been resorted to, and we get the opportunity of examining the pulp prior to its entire death, we always find that the point of inflammation and disintegration corresponds to the point of complete or approximate exposure, and that a stinking decomposition has been set up at this point, while the rest of the pulp is alive, and, as far as we can see, healthy, beyond this zone of inflammation. So far it looks as though something getting in had done it, as though microzymes had entered, and the inflammation were comparable to that in a cornea of which the surface has been

damaged; actual observations on the presence of bacteria at this stage are, however, wanting, and they are much needed. I have only a single observation to record, in which I found the bacteria abundant.

On the other hand, as Professor Burdon Sanderson well insists, the view that all inflammations are due to organisms is quite untenable, and inflammation may spring up at once in a part which has been subject to damage, without the possibility of the entrance of germs; so that we are by no means driven to the absolute conclusion that the bacteria which I found were the causes of the inflammation. But these inflammations which are the result of physiological "damage" to a part, elsewhere come to a kindly ending. In his own words, "an uncomplicated inflammation is neither reproductive nor infective, neither benign nor malignant; if it has any tendency, it is to leave off as soon as the occasion for it passes." Therefore the tooth pulp, supposing that it really has inflamed before its death, should not on that account give rise to products capable of poisoning the parts about the apical foramen.

At page 293, he says: "I endeavored to show, on the ground of experiment, that the only inflammations to which minute organisms stand in relation are those which, from their proved dependence on previously existing inflammation, may be properly termed secondary or infective; and consequently that the organisms in question were not so much mischief-makers as mischief-spreaders. That is to say, although an inflammation may come into existence without their aid, their presence communicates to it, after it has come into existence, the power of reproducing itself in previously healthy tissues, whether by extension or dissemination. These facts he sums up: "1. That the exudation of a normal inflammation is not infective. 2. That no organisms endowed with inflammation-producing functions exist in the atmosphere or in ordinary aqueous liquids with which our bodies come in contact. 3. That whenever an inflammation becomes infective, it owes that property to chemical change in the exudative liquid, of which the presence of microzymes is a necessary condition." Now if we attempt to apply these canons to dental diseases, we are at once struck with the fact that the contents of the pulp chamber of a tooth are in a sense virulently infective, for the escape of the smallest quantity from the apical foramen sets up a most violent inflammation and abscess, which, however, only very rarely spreads further (though in one of my cases in which the patient was long in seeking relief there was almost erysipelatous inflammation of the face attended

with considerable fever), but there is, so far, no difficulty in understanding how the tooth pulp may have complied with the conditions laid down by Professor Sanderson, as to a prior inflammation, the exudation of which, with the presence of organisms, has become infective. But it is a matter of some moment to us to discover, if possible, whether we have most often to deal with an inflammation caused by the invasion of the pulp by microzymes, or set up by irritation, for in the one case the profuse and persevering use of antiseptics is indicated, in the other sedative applications, and this point can only be elucidated by very numerous and very careful observations.

Passing now to our second group, we have by accident most instructive experiments brought under our notice not rarely, when the pulps of front teeth which have been severely struck die, although the hard tissues of the tooth are quite intact. Here we have a portion of tissue dead, which has in no way been exposed to external agencies. No germs can have entered it from without, and it is in this respect in the same position as the testis killed by "bistournage," or as a portion of tissue cut out and introduced into a flask with antiseptic precautions. It therefore might fairly be expected to remain mummified without undergoing any putrefactive decomposition; and this does sometimes happen, a case of this kind having come under my own notice, since my attention has been specially directed to the subject.* But much more frequently, after an interval of exceedingly variable length, violent alveolar abscess ensues, and on opening up the tooth by drilling into it we find the contents of the pulp cavity stinking, whilst the violence of the alveolar abscess betokens the virulence with which the tissues adjacent to the apical foramen have been infected.

It becomes a matter of the greatest interest to discover whether organisms do or do not play a part in this sequence of events, and the solution of this problem has a bearing on questions far wider than the field of dental surgery. And the importance of the experiment is almost equally great, whether it turns out that bacteria or micrococci are there, or not. For if there, they must have got there by way of the circulation in a healthy individual, and must have been (1) present in the tooth pulp prior to the accident, or (2) have entered it during the brief period of inflammation which we know clinically to sometimes intervene between the injury and the death of the pulp, or

* And since the reading of this paper I have met with two central incisors, the pulps of which had been killed four years previously; there was tenderness and slight fullness over the apices of the roots, and the pulps themselves were coherent, white and sodden, but without any offensive smell. No bacteria were found.

else, if the death of the pulp has been instantaneous (3) have crept in by the apical foramen subsequently—a hypothesis which does not commend itself as probable.

On the other hand, if, after extended and numerous observations, no organisms prove to be there, we shall have proof of a putrefactive decomposition with stinking and poisonous products taking place without the intervention of bacteria or micrococci; in other words, that which, according to the doctrines of modern surgery, ought to be in the condition of an aseptic slough, becoming septic.

One does not meet with these cases very frequently, and it would require a large number of observations to prove a negative, yet so far I have not succeeded in quite satisfying myself of the presence of either micrococci or bacteria in any case which I have examined; in one case I found a few bacteria, but they were so few, and so unequally distributed over the slide that I suspected their not having been derived from the fluid from the pulp chamber. The question, then, for the present remains open, but I would point out that the occurrence of alveolar abscess after the death of a pulp killed by a blow is very often a slow process, extending over months or years, or never happening at all, whilst an abscess usually follows very speedily on the heels of the death of a pulp which has been nearly or quite exposed.

And whilst it is comparatively easy to find bacteria, or be satisfied of their absence, it is very different with the round micrococci, for the debris of these pulps is almost made up of granular material.

The third group of cases are those which are most troublesome in our daily practice, those cases, namely, in which alveolar abscess recurs after we have done what we can in the way of treatment. It is, of course, a familiar fact that if we can pump creasote through the apical foramen and out through a fistulous opening on the gum, that alveolar abscess may be readily and speedily cured in almost every case, and this would seem to point to its being kept up by organisms. As a matter of fact, I have frequently found them present in the pus, and again sometimes I have failed to find them; but I attach little importance to this, inasmuch as I have found them abundantly one day, and on the next, the abscess having meantime greatly subsided, have found very few.

The cases, however, which are most important, and most troublesome, are those in which the roots have been thoroughly treated with antiseptics, and filled, say with cotton wool, saturated with creasote. The tooth has remained quiet for a considerable time, and

then becomes tender and an abscess threatens. On removing the filling the wool from some one of the roots is found discolored and offensive. It is hardly to be supposed that organisms have got in subsequently to the filling by way of the tooth, so here again we are in face of alternatives; either we have that which is generally believed never to occur, a putrefactive decomposition without the intervention of organisms, or the germs have escaped the creasote, lain latent for a time, and then developed.

It is a familiar observation that cold will provoke an inflammation about a heretofore quiescent dead tooth; this would be intelligible enough as an instance of a "damage" to a part already perhaps below its standard of health, but whence come the stinking products which leak into the roots of the tooth if there are no microzymes?

And these products we know to be infective, for if in our manipulation we pump anything, no matter how little, through the apical foramen, we set up an acute abscess. Of these cases I have not had an opportunity of examining a sufficient number to draw any conclusions, but I may remark that the late Dr. Dean, in a paper on alveolar abscess, read before the International Medical Congress, laid much stress upon the application of the rubber dam to a tooth in which an alveolar abscess had been cured prior to the removal of the dressing; and he was advocating these "antiseptic precautions," although speaking purely from the clinical point of view. I myself asked him the question, prior to the reading of the paper, whether he advocated this precaution for a theoretical reason, or as a result of practical experience, and he told me purely on account of the latter. He saw, then, from his clinical experience, the necessity of excluding something; of its nature he was uncertain.

On the other hand, if we are contending with living organisms, it is strange that we cannot secure more uniform success, for we are able to bring into play antiseptics with a directness and in a strength impossible elsewhere in the body.

To recapitulate briefly, it is believed that:

1. Putrefaction with the development of stinking products depends upon the presence of organisms.

2. Inflammation may be directly caused by organisms, or it may arise independently of them.

3. Infective inflammations are associated with the presence of organisms.

And we find that:

1. Tooth pulps nearly exposed by caries inflame, die, putrefy, and infect the parts around the apex of the root, and that organisms are found in the debris of the pulp and in the pus of the subsequent abscess.

On the other hand that:

2. Tooth pulps never exposed to external contamination die, putrefy, and infect the parts outside them; and that organisms have not, so far, been satisfactorily demonstrated in them.

And again:

3. The dressings in the roots of dead teeth, under circumstances which would render the multiplication of organisms unlikely, do become saturated with offensive fluid.

But against this last we may set the fact that success in the treatment of alveolar abscess seems to be about proportionate to the completeness with which antiseptics can be brought into contact with all the surfaces concerned.

I feel that I owe this meeting an apology for bringing before them so imperfect an investigation; but there is one excuse for my doing so, and that is, that it is an investigation which to be at all fruitful of results must be carried out by many observers, and, so far as I know, attention has not been very definitely directed towards it. I hope, for my own part, when my observations have become sufficiently numerous, to publish them in detail, and that, by that time, there will be many others to confirm or disprove them. It may well be that the pursuit of this line of investigation will lead to most practical results in dental surgery, for if it be the case that rigid antiseptic precautions are our only road to success, we have excellent means of applying them by the use of the rubber dam. I may mention that I have lately always, when practicable, removed devitalized pulps under a pool of eucalyptus oil, so that this may run in as the pulp is removed, and no septic contamination take place during this part of the operation; but as good results are ordinarily attainable without this precaution, it is too soon to speak of its value.

On the other hand, failing a practical result for dental surgery, the investigations cannot fail to be of value in throwing light upon a great question of pathology, for the isolation of the pulp chamber of a tooth eliminates a great many of the sources of error and uncertainty which beset similar research upon other organs of the body.—*Journal of the British Dental Association.*

"WRITE THE VISION AND MAKE IT PLAIN."

BY C. T. STOCKWELL, SPRINGFIELD, MASS.

In the January number of the Ohio State Journal, Dr. Watt, its editor, makes the "greatest effort of his life" in an attempt to demolish the germ theory of dental caries, and defend the chemical. In this article I have not the slightest wish or purpose to reply to his lengthy and amusing allusions to my paper, published in the November number of the New England Journal. If he—Dr. Watt—his listeners, or his readers enjoyed, in the least, his sallies of wit, etc., they are all most heartily welcome. Witticisms do not annihilate facts or befog the thinking mind.

We have to thank Dr. Watt, however, for giving us so clear a statement of the *process* of chemical action. It is so good that we must quote it here.

"As ammonia is composed of nitrogen and hydrogen, its oxidation results in nitric acid and water. . . . Remember, too, that ammonia always results from the putrefaction of nitrogenous organic compounds. Suppose an atom of nitric acid has got through the enamel—not through the hole that Mayr's bug goes in at—but through a defective spot. It acts on the dentine—faster on the lime than on the gelatin." (Gelatine?) "A thin layer of the lime-salts is dissolved, and of course, a thin layer of organic matter is left. By putrefaction it gives ammonia, to be oxidized into nitric acid, to dissolve more lime, and expose more organic matter, to putrefy and give more ammonia, to be oxidized into more nitric acid, to dissolve more lime-salts,—and thus, on and on, till the pulp cavity is reached."

We said we have to thank Dr. Watt for so clear a statement. It occurs to us, however, that it is possible to "write the vision and make it *plain*"*-er*. Let us see. We will suppose that a particle of meat, say one-half grain, is lodged between the teeth. Now we will grant that the result of the putrefaction of this one-half grain of meat *may* be, first, ammonia; that the ammonia *may* combine with oxygen (ozone) and form nitric acid; that this nitric acid *may* attack the lime-salts of the teeth, and as a result of this attack upon the lime-salts, by this nitric acid, a portion of the organic matter *may* become unclothed, "as it were," which *may* die, when we shall have some more "*meat*" to putrefy and produce some more ammonia, which *may* combine with more oxygen and give us more nitric acid, which *may* attack other granules of lime and uncover some more *organic* matter to die, to putrefy, to form more ammonia, to be oxidized, to result in more nitric acid, etc., "and thus, on and on, till the pulp

cavity is reached." All of this *may* (??) be admitted to be *theoretically possible.*

Now let us apply a few figures to this beautiful *possible* theory and see, if we can, how small a hole Dr. Watt is driven into in order to explain the process of chemical action in dental caries. Perhaps we should say "white decay," much, by far, the larger proportion.

We will take our supposed one-half grain of meat—a liberal allowance—and lodge it between somebody's molars. We will grant that it will putrefy. But will it putrefy if *no organisms* are present? We will grant that the result of the putrefaction of this one-half grain of meat *may* be ammonia; but under the conditions found in the mouth it *may not,* too. Granting, however, that it does produce ammonia, it will require, at least, *two days* to bring this about; and then *how much* ammonia have we got, practically, from this one-half grain of meat? Well, to be liberal, we will say about $\frac{1}{500}$ of a grain. Now we have $\frac{1}{500}$ of a grain of ammonia between our supposed molars—but there is some saliva there too. But we will allow that all of this $\frac{1}{500}$ of a grain of ammonia *may* become oxidized,—practically a small fraction of it, say $\frac{1}{10}$ will possibly become oxidized,—and that we have some nitric acid in the "nascent state." But *how much?* To be liberal still we will say, about $\frac{1}{4000}$ of a grain. Now this $\frac{1}{4000}$ of a grain of nitric acid will have to be *lively* or it will become diluted with the water that is set free at the same time it is born from the ammonia—to say nothing of the saliva it finds itself in. However, Dr. Watt's nitric acid *is* a lively kind, so we will admit that this $\frac{1}{4000}$ of a grain of nitric acid *may* (*?*) get hold of some lime-salt in the unfortunate molars between which it finds itself. Again: *How much* lime will this $\frac{1}{4000}$ of a grain of nitric acid *dissolve,* even when it puts in in its best licks and starts when it is "a-borning," or in its "nascent state?" You must guess at the figures to apply here. We may admit the *possibility* that some infinitesimal amount *is* dissolved—about $\frac{1}{10000}$ of a grain of lime. Then what? Why! this $\frac{1}{4000}$ of a grain of nitric acid is neutralized, the affinity satisfied, and the acid is rendered harmless. But Dr. Watt says that there follows a disastrous sequel. "A thin layer of organic matter is left." Would to the Great Goodness that he had told us how "thin" this "layer" is that "is left." It must be *thinner* than "the hole that Mayr's bug goes in at" by several furlongs. Having granted so much already, we must still allow that some (?) organic matter is laid bare, and that we have some more "*meat*" to putrefy, to give more ammonia,

to oxidize, to give nitric acid, to again dissolve still more lime, etc. But he forgets to demonstrate just how this second dish of "*meat*" is slaughtered, and by what agents. Live tissue does not putrefy and give us ammonia to form nitric acid, to attack the next "layer" of undissolved lime, and so "on and on, till the pulp cavity is reached."

When we see that our one-half grain of meat gives only about $\frac{1}{4000}$ of a grain of nitric acid, we see the need of some beautiful microscopical figuring to get at the actual or even approximate amount of nitric acid that *may* (???) be generated from "the thin layer of organic matter that is left" as the result of the first attack. Estimate, if you can, the figures that will represent the weight of this "thin layer," and the amount of nitric acid that can by any possible means result from the *possible* death and putrefaction of the same. By the same basis of calculation—by no means fanciful—we have simply $\frac{1}{20000000}$ of a grain of nitric acid. Remember also that this is only the *second* term of the infinite series of the putrefactive process. As we proceed, we get an attenuation that ought to electrify the most ardent Homœopathic school of high dilutionists, for the *third* term would give us $\frac{1}{40000000000}$ of a grain of acid to dissolve (*how much?*) lime of the *next* "layer." Again: Estimate, if possible, the number of quintillion times that this process must be repeated before "the pulp cavity is reached" in an average adult's tooth, and the number of *illions* of years it will require to accomplish this result, even under the most favoring conditions. It 's the old story of Achilles and the snail. The snail ("the bugs") arrives at Troy in advance of Dr. Watt's Achilles (nitric acid).

If it requires at least two days to bring about even the *beginning* of ammonial elimination in our one-half grain of meat, and we allow that the hypothetical series may even be completed in the same time, we can *begin* to calculate—we can do no more than begin—the number of terms in the series that are *possible* in a year and the age of our Methuselah when the *contents* of "the pulp cavity" will begin to react upon Dr. Watt's rapidly on-going nitric acid. This may seem to be an attempt at ridicule, but it is not. It is simply an attempt to apply honest figures to a chemical proposition, and it is not the first time that a chemical proposition has gone down under the weight of its mathematical inaccuracy.

If such be the truth in regard to the chemical theory of dental caries, is it any wonder that no one but Dr. Watt dared to attempt an explanation of the *process*, or when asked just how acids performed

their accredited work, the reply was so positively nebulous? We are monstrously dazed at the audacity of a man who can put forth such a theory and still claim to be in a normal state of mind—if not of body. Such a mind must be in a "nascent state," as sure as the gods.

In connection with this hypothetical statement of the action of nitric acid in white decay, it may be well to offset the positive statement of a competent chemist that no acids or compound of acids and lime-salts are to be found on the field of battle, and that by the concurrent testimony of numerous microscopists, Bacterial organisms are found present in every case. Dr. Watt, himself, after beating the bush persistently and vigorously for forty years, only claims to have seen the "*tracks*" of his pet dragon. No game dangles at his belt after so long a chase in the wilderness. But he is sure that the beast is there, for his *supposed* tracks are all about. Isn't it just possible that the particular animal that the Dr. is looking for did not make the tracks and is not in that jungle at all? The germ theorists have not only the tracks, but they also exhibit the game, and can "write the vision and make it plain"–er to those who are not blinded by some pet theory that must be maintained in spite of revelations of facts that leave to them only the most vague hypothesis and misty sophistry.

SOME INTERESTING CORRESPONDENCE.

It was our fortune to be shown some interesting correspondence, between two well-known dentists, regarding the etiology of dental caries, and as it seemed to us too good to be thrown into the waste basket or, rather, too good to be kept as their own sole property, we have secured it for publication in order that the profession may have the benefit of the discussion. It was written simply as friendly letters are usually written between parties interested in a common subject, without the slightest idea that it would ever appear in print, and we give it without material change or modification, save making it anonymous. If our readers will follow it carefully, we think they will agree with us that some good points are made, and these letters are of more than private interest and value. We trust, also, that the series is not concluded. We only regret that we cannot give, as a preface to these letters, a report of the personal discussion of which they are the evident sequel. It may, however, be inferred from the character of the letters that follow.—Ed.

Dr. A.

Dear Sir: In our little talk last evening, I mentioned the *possible* agency of germs in caries, by absorbing pabulum from dentine; also, possibly, by appropriating oxygen or other elementary substance from tooth structure.

I might have maintained another *possible* modus operandi, viz., their influence in changing nerve function.

I need only to call your attention to the fact that nerve matter—or fibrillæ—seems the last to yield its activity in caries. In the softened dentine, where germs (Bacteria) are abundant, nerve matter is found in a very active condition.* We need only to remember the function of nerves in all physiological action to see the possibility that normal nutrition can be greatly impaired through the whole line of dentine by changes made by Bacteria upon their yet living terminal portions in the softened dentine. To understand just what these changes can be, we need more knowledge of vital processes in animal tissues, or, as Prof. Mayr says, "of the chemistry of albumen."

I make these suggestions for subject of thought. Pins set up for you to to knock down.

Yours truly, B.

Dr. B.

Dear Sir: Your kind letter is duly received. You are right in regard to the fibrillæ being the last dental tissue to yield its activity in caries. The microscope shows that to be a fact. As to the agency of organisms in absorbing pabulum by appropriating oxygen, etc., from tooth substance, I cannot have any *positive* opinion either way. We may judge from the fact that caries is apt to progress in finely filled cavities where no "antiseptic" has been used, that many species of Bacteria do not depend upon the oxygen of the *air* for development. But in the *depths* of zone-like softened portions, where a small crown cavity has existed for years, and where, in this softened portion, deep into the crown, we find that which, according to Miller, is a Bacillus, we would, upon such a theory, expect proliferation of Bacilli and destruction of dentine. This is not so. Everything in the way of breaking down has ceased long since in *many* such cases. Your suggestions are, however, most tersely put, and they should have a careful consideration.

I have a different view of your position than I had previous to our

*The sensitiveness of carious dentine is probably due to to the presence in it of living fibrils which have escaped the action of organisms.—B.

interview Tuesday eve. I only wish it were so we could have them often, and I am glad to see that it is broader upon this subject than I had supposed.

If Bacteria, by their presence in the softened dentine, interfere with nutrition, which is no doubt true to a certain, though to what extent we don't know, but must find out if possible—the decay—after inception in *live* teeth, is to *my* mind due to *atony*—germs being the *cause*, if you please, but in no other sense.

I believe that you now understand my position. If I have any theory, it is the atonic, and that theory will apply to live teeth—and if we understand that a low circulation—nervous—in "devitalized" (*pulpless*) teeth is maintained through the pericementum, the theory will apply to them as well—though I feel very certain that in the latter condition—that of "dead teeth"—the product of fermentation and putrefaction causes a more rapid disintegration of the basis substance, so that we *never* find in pulpless teeth, that have after losing their pulps become carious, the fully formed basis substance in the cavity; but, on the contrary, a very soft, offensive amount of debris.

I have said all along that I have *no* theory. I have meant it, too; and it seems unfair to be judged as wrong in insisting, as I do, for *facts* first. What facts I have look more favorably to the theory of atony than to organisms. You perhaps say, "Well, but organisms cause the atony! What is the difference between us?" Just this: You say, "A man was injured by being run away with." No, he was injured by striking the ground—it of course being conceded that if the horse had not run he would not have been injured.

Still, we are far from the primary cause of decay. General atonic conditions cause the special conditions favorable to tooth caries. What causes the primary lesion? Let us be careful, studious and modest in our work, stating facts as they are developed.

Truly yours, A.

P. S. You are very kind in furnishing me with the valuable food for thought your letter affords. I find no "pins" therein to "*knock down*," but, instead, I find some pins to be interwoven in the lining of my hat!! A.

Dear Dr. A.

I am glad you think my *perhapses* contain food for thought. I am constantly looking for facts upon which to form a theory. Allow me one word about this term theory.

In its application to dental caries, I understand it to mean the arrangement in the mind of discovered facts, so that the relation which each fact bears to the other facts shall be obvious. At present, we have the component parts of enamel and dentine, the form of structure, the arrangement and juxtaposition of teeth favorable and unfavorable to the retention in contact with them of injurious matter. We have acids, alkalies, organisms in all stages of development and conditions favorable to mechanical abrasion. We also know that caries exists, and something of its morbid anatomy. While these facts exist in the mind in a chaotic state, we have no theory; but when we have shown the relation in which these facts stand to each other, which are causes and which effects, which primary and which secondary, and which only sequences, a theory has been presented. I think a theory may be defined thus: The arrangement of facts in the mind, so as to show the relation of parts to the whole phenomena of dental caries.

For a statement of the chemical theory, I refer you to Dr. Watt's paper.

A word in relation to the germ theory.

First, it does not imply that acids, alkalies, abrasion, defective formation of enamel and dentine, inherited tendencies, conditions of health and degrees of vitality, some or all of these do not furnish favorable conditions for germs to begin and prosecute their work. But it does mean that these conditions being present, caries is largely due to the action of Bacteria and other fungi. These are the septic agents without which the other conditions and agents would be comparatively harmless in producing dental caries. Their mode of operation may not be yet understood. That they may bring about caries by interference with nerve function, by the absorption of nutritive material, or by appropriating some elementary constituent of formed tissue, perhaps oxygen, seems not improbable. To me the point of greatest interest just now is, how do fungi first penetrate the enamel? By an open door? Yes, often. Do they ever open the way for themselves through perfect enamel? Possibly. I have said enough —Good night.

Yours truly, B.

DEAR DR. B.

I have been thinking over this last excellent letter of yours, and as I have time I will devote some to a reply.

Of course, you do not think that I do not understand the definition

of theory, nor the application of one to dental caries. I think I do understand it, and my objection to formulating one upon the subject has been, and is based upon this, that our facts are not sufficient, *as yet.* We are rapidly gaining these, but we are gaining also with them some *pseudo-facts.* I accept your position *fully*, and I accept because it is a true exposition of my position, only I could not qualify it so well as you certainly have done. Now, we can begin to talk. Don't you see that the atony theory more fully meets all requirements? that it *more* fully accounts for the different types of decay, from the white to the black, than the germ theory does? Germs can *maintain* this disease so long as life forces are *weak*—no longer. Then, again, the *primary* cause of caries is still unknown, and in the case of perfect enamel and dentine, where decay exists, the *cause* of the disease is unaccountable on *any* theory we have, except the chemical. If, as Prof. Mayr says, the oxalate of ammonia test will show lime in sputum ejected after bringing acetic or citric acids in contact with teeth in the mouth, there is a proof at once of chemical action, the *least* softening affords a field for propagation of Bacteria. Then the work of appropriating nutritive matter at once begins, etc.; *but* we always have to presuppose a softening from the first period to the last, in *advance* of organisms. Now it is this pioneer corps that we are after, and until we come up with it, and properly interpret it, we cannot form an *intelligent* theory. So far as we have advanced, however, the atony theory is in advance of the germ theory to *my mind.*

Yours truly, A.

Dear Dr. A.

In dental caries I am disposed to limit the word *cause* to those forces which are essential in constituting and giving character to the disease, and to call other forces and conditions which of themselves do not make caries, by some other name. For instance, acids may cause *abrasions*, by dissolving away the lime and leaving the animal matter to be easily worn away. So weak an acid as that must be, which comes in contact with enamel, can hardly even irritate the vital structure, and acid in the "*nascent state*" is so infinitesimal that its effect and presence even can only be conjectured. Acids acting upon enamel can only cause abrasion. It seems that another agency is necessary to set up that self-sustaining process which is found in caries.

Now can atony do this? Atony is only a negative property or condition of vital tissues and organs. Atonic condition of the living structure may furnish less resistance to other forces, perhaps, but can

it be said to produce caries? Is it not itself a condition resulting from caries?

What do you say to statements like the following?

Acids may cause abrasion of enamel and dentine, but cannot of themselves produce caries.

Organisms may produce caries when conditions permit their access to the animal structure of enamel and dentine.

Abrasion and imperfect organization of enamel furnish favorable conditions, and uncleanliness furnishes the lodgment for Bacteria.

Organisms may appropriate protoplasm and the elements of tissue, and change nerve action so as to diminish vital resistance (causing atony), thus making conditions still more favorable to the progress of caries. The condition called "zone of resistance" may be produced by Bacteria, they withdrawing protoplasm, leaving the lime-salts in an abnormal combination with the diminished quantity of soft tissue.

The above is modestly submitted to your "hat lining."

Yours sincerely, B.

DEAR DR. B.

You must be very careful or you will soon be beyond my powers of speculation, for it must be admitted that we are in this discussion upon ground highly speculative.

Your disposition to limit the word "*cause*" to those forces which are essential in constituting and giving character to the disease, etc., is of itself misleading, if we are to further our efforts in the direction of *How* and *Why* do we have a primary lesion in the enamel. For it must be continually borne in mind that we are seeking *causes* and not *sustainers* of the phenomena, dental caries; that only by a correct knowledge of those conditions about teeth that *produce* the enamel lesions, can we hope to intelligently treat them for prevention of the primary or secondary types of the disease.

The living matter in the enamel may be irritated by external agents, and yet no disintegration result from it. Let me illustrate by a case in practice: A young lady of 19, of an active, nervous temperament, has for two years suffered *periodically* from extreme sensitiveness (to *the touch* of any metal substance) of her superior incisor teeth. These teeth have small proximal fillings of gold, placed five years ago. They have needed no attention since, being as perfect to-day as when inserted. The teeth are large and well-formed, have ample room and are regular; but they are not of true color, being slightly opaque. The alveolar and gum tissues are apparently in perfect health. The

enamel is perfectly smooth, and not a spot of imperfect formation is visible. Dilute chloride zinc will give temporary relief; precipitated chalk freely used just before retiring gives relief. Abate such and other treatment, and the trouble returns; therefore, we see, in rare cases, that the living substance, even in the enamel, may be irritated; that a coagulating and antacid treatment affords relief.

I have no reason to look otherwise than favorably upon the theory of micro organisms *sustaining* a process of decay by appropriating oxygen and other nutritive elements from the organic matter in dentine, but it is a mere theory after all.

You speak what is to my mind a *great truth* when you say, "Abrasions and imperfect organization of enamel furnish favorable conditions, and uncleanliness furnishes the lodgment for Bacteria." We can hardly say that organisms may cause atony by the appropriation of nutritive material or its elements. Atony is the *constitutional* condition, and of course is a negative one. You have what is to my mind—humble though it be—a *correct* idea of Magitot's *zone of resistance.* It is lime-salts in "abnormal combination"—whether produced by Bacteria or not, I would not say. My "hat lining" is being filled with a bristling array of excellent pins given by my good friend.

Yours truly and sincerely, A.

DEAR DR. A.

You say, "Atony is the *constitutional* condition." It may be a constitutional condition, and it may be also a condition of an *organ* or a *tissue.* I said, "Organisms may cause atony" (meaning atonic conditions of dentinal fibrils) "by the withdrawal of nutritive material." If in addition to this there exists constitutional debility in consequence of which protoplasm in normal quality or quantity is not supplied to the fibrils, so much greater their debility, and so much less the resistance they are able to offer to caries-producing agents.

You say, "We are on ground highly speculative." If by speculative you mean visionary, not supported by facts and their reasonable interpretations, we will go no farther in this direction. But if you mean the better sense, the scientific and philosophic study of phenomena which have so long remained in doubt, we shall do well to go on. In our familiar way we can exchange ideas and examine facts and authority, both as a matter of pastime and of profit.

I presume you will bear with me while I refer to your question, "How and why do we have a primary lesion in the enamel?" Be-

lievers in the germ theory do not question that acid causes erosion of enamel, but they claim that erosion and caries are entirely different lesions. Erosion and abrasion may exist without caries. You think them a *cause* of caries. I regard them as a *condition favorable* to caries, the same as are structural imperfections of enamel.

Whether organisms carry their acid bottle with them to the border line of decay with which to dissolve the lime-salts, that they may gain easier access to the fibrils (see papers by Underwood, Sewell, Miller, etc.), or whether they destroy the living matter and as a sequence the lime-salts fall to pieces and remain as debris (Mayr) the savans must decide. In either case *caries* seems to be a disease of the living structure, while erosion by acid is the chemical decomposition of the lime-salts, confined principally to the enamel. If it penetrates to the dentine, the " eroded cavity is hardly ever undercut." How different this from the phenomena of caries, with its deep undercuts, its organisms and its irregularly penetrating lines of decay.

Cordially yours, B.

NOTE.—I have seen slides which seem to show that something (what more probable than *organisms*) causes devitalization of fibrils a little in advance of the fungi.

EDITORIAL.

ABSTRACT OF EDITORIAL IN NEW YORK MEDICAL RECORD, January 13, 1883.

"The New Pharmacopœia," after alluding to the importance of the work and its large circulation, the article refers to some of the conclusions which have been arrived at :

" For the first time, says Dr. L. Genois, in the College and Clinical Record, there has been given a concise but explicit description of vegetable and animal drugs. The new work abandons the old division into primary and secondary drugs and preparations. Instead of this, the list is arranged in alphabetical order.

" A large number of articles are dismissed, the total being about two hundred and thirty.

" With hardly an exception, the drugs or preparations omitted, we are well rid of. For the rest, there is nothing that will seriously embarrass druggist or physician. Perhaps the latter will most miss the

liquor morphiæ sulphatis and santonin—for which latter the santonate of sodium is substituted. The number of new articles introduced is about two hundred and fifty.

"A new class of preparations have been introduced which are called 'abstracts,' a name which we regard as a most unfortunate one. The term 'abstract' having become a part of medical periodical literature, and it at once suggests scissors and second-hand articles. To associate it with a powdered drug will require the beating out of new cerebral paths in medical minds.

"A prominent feature in the Pharmacopœia consists in the adoption of parts by weight in the process of pharmaceutical preparations.

"This change is of more interest to druggists than physicians, however, except as it perhaps foreshadows an adoption later of the metric system.

"Valuable tables of the solubility of chemicals in water and alcohol, of saturation of alkalies by acids, and of acids by alkalies, are given. Some alterations have been made in the relative proportions of active constituents to the finished preparations.

"The alterations chiefly affect the tinctures. These changes will not affect the dosage very much, the actual change even in the opium preparations being less than has been rather sensationally announced.

"There has been a change made in the terminal nomenclature of the organic alkaloids, the suffix 'ina' being uniformly used instead of 'ia,' as in 'quinina' for 'quinia.' This will make little practical difference in prescription writing.

"The diluted mineral acids are all to be prepared with a strength of ten per cent. This makes hydrochloric acid one-fourth stronger, and sulphuric acid one-sixth weaker. The tincture of aconite root is reduced one-seventh, and its name has been changed to simple tincture of aconite. The extract of aconite is now to be made from the root instead of the leaves, and is said by Dr. Wood to be nearly one-half stronger than the old extract of the leaves."

In conclusion, the article says: "It may be positively stated that, on the whole, it is the best work of the kind in any language."

A PLEASANT REMINISCENCE OF DR. WEBB.

The Coatesville Times, in referring to the death of Dr. Marshall H. Webb, in this city, gives this pleasant reminiscence of him when a young man:

"When a boy, living with his father, in East Fallowfield township,

Chester county, some figures which he had carved from wood and set to playing antics by water power in a stream near his father's house attracted the attention of Dr. Frank Hickman and Professor Jonathan K. Taylor, of Coatesville, who were riding by. They hunted the boy up and found him frank, modest and attractive. Dr. Hickman, who was a dentist, was struck with the boy's mechanical skill, offered to take him to his home and teach him the art of dentistry, if Professor Taylor, who then was Principal of Chester Valley Academy, in this borough, would assist him in his scholastic studies. This was agreed to, and Marshall, or 'Marsh,' as he was known in those days, became a resident of this town in 1861. He progressed admirably with both studies, and upon his graduation settled in Lancaster. His practice grew rapidly, and he was soon regarded as the best dentist in that city."

A few of our old subscribers have not yet sent in their "enclosure" for renewals. It is just two dollars, gentlemen.

It seems to us that Dr. Watt likes to "discuss" (?) the etiology of dental caries with Prof. Mayr, after all. His "adieu" meant, simply, *au revoir*.

The article by C. S. Tomes, F. R. C. S., that we give in this number, is a long one, but worthy of a careful reading by all who are interested in the investigations of the day.

Operating Table and Laboratory.

A REPORTED CASE OF MERCURIAL POISONING BY RED RUBBER.

The story of a patient being poisoned with mercury from a red rubber denture has been going the rounds (in this vicinity, at least,) of late. In a few words, this is the case : A lady in Westfield, Mass., has been quite out of health for some five or six years, during which time several physicians were employed, but without improvement. During the last year, however, a physician was found who apparently succeeded in helping her. On being interviewed, he says : "I did not know that she had worn red rubber plates, and never thought anything about the possibility or probability of the mercurial influence coming from that source until after the diagnosis was made ; however, her symptoms clearly pointed to poison from *vaporized* mercury, which differs from other forms of mercurial poisoning. The talk about 600°, more

or less, of heat being requisite before mercury can be set free in the mouth is all wrong, that being simply the *boiling* point. Mercury will vaporize at 62°, which is lower by 30° than exists in the mouth. I am decidedly of the opinion that the patient is suffering from the poisonous effects of the *red* rubber plates."

This is all our correspondent writes, though we hope to learn more of the case soon, when we shall have some comments to offer.

PRACTICAL ITEMS WANTED.

As a profession, we are all taught the idea that a dental journal is primarily for the purpose of making known to each other our experience, methods of practice, etc. As a fact, the contributors to our journals are but very few in number—not one where there should be a hundred. The result is, that many who take a journal very likely look it over and throw it down in disgust, because there is not more of practical value in its contents. We wish, gentlemen, you would just stop right here, and meditate for a few moments and see if you cannot readily find the explanation. Is it not that you, personally, as well as scores of others, are not "doing as you would be done by?" You are perfectly willing to receive, but never to give. We will endeavor to be charitable on the ground that you may be one of the extremely modest sort, not inclined to consider that your gifts are equal to others. We assure you, however, that you are just the one we want, and that when we hear from you the communication will be something more than "directions how to prevent dark joints in a rubber denture"—not that that is not a desirable thing in itself, but it is so old a subject that every dentist (and student) ought to be ashamed if without the knowledge, and also the ability, to overcome the obstacles to that end.

In reading the different publications from month to month, do you not realize that there are many little hints and suggestions you might make which you have never seen in print, and which you consider of much value? It is just these items we want, and when we say we, we mean the profession. Write down a few of these items and send them in and, our word for it, not only others but yourself also will find the journal much more interesting. Out of the hundreds who read these lines, and are eminently qualified, how many will spend a few moments in this manner? Let us hear from you, gentlemen, and let the communication be anything from a formal paper to two-line items, though the last are perhaps preferable.

MICROSCOPICAL.

On December 26, 1882, I received the following letter, and package mentioned in the letter:

102 Touro Street,
Newport, R. I., December 25, 1882.

Dear Dr. Ross—I send you herewith a right upper first molar that I have just extracted from a healthy looking plumber, perhaps twenty-five years of age, and evidently a user of tobacco. He says he has had no trouble with the tooth until within the past twenty-four hours. During the night it had ached quite severely, but no especial tenderness to pressure had been developed. Immediately after I extracted it, I immersed it in diluted alcohol, in which it has remained several hours. The paper in which it is now wrapped was dampened with water and glycerine. The abnormal growth between the roots is to me quite a curiosity, though I have at long intervals seen several similar instances of it. It occurred to me that you might like to make some study of the histological character of the tissue.

Very truly yours,

C. A. Brackett.

Extending from a line below the base of a distal cavity in the crown to between the roots was a growth that did not show firm attachment except at the point where the growth evidently first developed at the cervical edge of a cavity below the margin of gum. At this point the attachment was firm, and at the edges of the growth it was attached to the pericementum upon the roots. The growth was quite extensive. I placed the tooth immediately in a 1 per cent. solution of chromic acid. After the surface had undergone sufficient alteration to admit of a few sections being cut, several were obtained with the section of growth attached. These plainly show the fibrous character of the growth, the endothelia of blood-vessels showing vascularity. The fibrous tissue was, at the point of attachment, continuous with the pericementum. The clinical and pathological features of the case grouped with the histological features show that the tumor was an epulo-fibro-erectile growth, probably benign, and not the cause of the pain that resulted in removal of the tooth. Deeper sections from the tooth will doubtless reveal pulpitis. It was an epulide; it was fibrous; it was an erectile tumor, because this class of tumors yield readily to pressure, but refill after pressure is removed. It was benign, because such tumors are seldom or never painful, while malignant growths are, in a like situation, painful from the beginning; and of the epulides we are taught that there are but two varieties that can

with any certainty be considered benign—the ordinary pulp fungoid that may always be considered benign, and some of the fibroids. Dr. Brackett has suggested that this case is one the like of which is not often met with by the dentist, and that its clinical and histological features are worthy of record. I therefore comply with his suggestion in reporting the case. I am indebted to the works of Professors Garretson and Heitzmann for enlightenment upon the obscure points.

A. M. Ross.

Chicopee, Mass., February 13, 1883.

CARBOLIC ACID.

Capping Nerves and Filling Teeth in Sections.

A great distinction must always exist between facts and theories, though it is evident that theories grow out of supposed facts. A thing stated that is not a fact will lead the credulous into error; and errors once adopted are hard to break away from. It is only by the most persistent effort that we can unlearn those things that we once considered vital to our interests. There seems to be an effort on the part of many individuals to belittle, and to lead others to abandon the use of, carbolic acid in the treatment of diseased and inflamed pulps. It is about the same cry that was raised thirty years ago against the use of mercury, and yet mercury is more extensively used in its various forms and combinations than ever before. To be sure, the blue pill and calomel are in a great measure abandoned, but mercury in some form is the "sheet anchor" (as was said in the olden time) with the regular practitioner, and enters into almost every form of pathy in the land. Until we can have something better, until we can find as painless and as salutary an agent to relieve suffering and help to save the teeth and restore them to good sound health, let us not call carbolic acid hard names. The great problems in dentistry are not to be settled by denunciation any more than is the Christian religion. It is better to "hold fast that which is good." It is possible that a revision of practice may be needed with some, but the happy effects of a thirty years' experience with this drug cannot be pushed aside by any denunciation whatever.

Having protested so strongly against this wholesale "slaughter of the innocent," we would like to say a word about its uses. First, carbolic acid paralyzes the fibrils of teeth so they can be amputated without pain, and still continued alive. Within the past two weeks

a little boy and a little girl had each the misfortune to have an incisor broken off by an accident in sliding down hill. Pain was relieved almost instantly by an application of carbolic acid. These teeth can now be saved by capping, if it is thought better than to have them extracted.

The failures often experienced in capping exposed pulps are due to the caps being misplaced after the oxychloride has been applied. When the powder is mixed with carbolic acid as the first dressing to prevent the harsh effects of the zinc in coming in contact with the pulp, and it is covered with *Guillois's* cement (we think that the strongest and best preparation), so that it adheres closely to the walls of the tooth, it must not be displaced. It does more than simply to cover and protect the pulp; it takes up that portion of the powder that is mixed with the acid, and lifts it away from contact with the pulp and relieves the pressure, and allows circulation to rally from paralyzation. This can readily be seen by experiment upon a piece of glass, and examination of the opposite side of the glass after the cement has hardened. Now, if an approximal cavity is to be filled, the cement should be removed from the cervical wall, about half way to the entrance, leaving sufficient room to start your filling, and the filling should lap on the cement to keep it firmly in place, when the lower portion can be cut away without danger of moving the cap from its original position, after which fill to the outcome and finish. There can be no danger of inflammation if carefully done, for the powder is lifted from the pulp, and circulation freely takes place, and the pulp is kept alive.

Our differences are often more in theories than in facts; but we must always keep in mind that discussions that are carried on in a kindly manner stimulate thought, and through thought the profession will grow. It is probable that gold will always be used as a filling material, but it does not follow that there may not be combinations of other metals with gold that will make a more perfect filling than gold itself. So, also, there may be substitutes for gold, but it still continues par excellence in the mind of the great body of dentists. Gold has stood the test of time for artificial dentures, but it cannot be made practical for the millions who wear artificial teeth, on account of the expense. Conservative practice is the best, for the ultimatum of that is to preserve the natural teeth. Iconoclasm is poor practice in dentistry. There were probably more pounds of mercury used as medicine forty years ago than now, but of the twenty different preparations and combinations—some stimulating, some escharotic, some drastic and

others sedative or secretory, some used in the most violent forms of diphtheria, and then again in almost all chronic difficulties—it is probable that mercury will do what no other medicine will do; and so with this much-abused carbolic acid as a helper in treating diseased teeth. I have never used eucalyptol, but I write in defense of carbolic acid as I would of an old friend when not present.

J. A. Robinson, Jackson, Mich.

A STEAM TRICYCLE.

We understand that a gentleman of Buffalo, N. Y., has invented a steam tricycle, which is reported to work to a charm—one gallon of gasolene (which is used for fuel) being sufficient to drive it fifty miles, the rate of speed attainable being anything under twenty-five miles per hour. We think the dental profession well qualified to operate such a vehicle, and so give the above item.

SOCIETIES.

THE BROOKLYN DENTAL SOCIETY.

The February meeting of the Brooklyn Dental Society, held on the evening of the 12th inst., at the residence of Dr. Thomas Fry, No. 18 Clinton street, was one of the pleasantest gatherings since last Summer's vacation, as well as of great interest to every one present. "The Etiology of Dental Caries" came up for the third time, and was discussed by Dr. Frank Abbott of the New York Dental College, and Dr. F. Y. Clark of 35 West 35th street, New York, one of the few members of our profession abundantly able to translate for us the unspoken language of the microscope.

Dr. Abbott, after a brief introduction of the subject, quoted at some length from the article of Prof. Mayr, in the last number of the *N. E. Dental Journal*, and from the article of Dr. Miller of Berlin, which appeared in the *Cosmos*. If Prof. Mayr is correct, said the Dr., then the acid theory must sink away down below par. Dr. Miller contends that the various microscopic organisms cannot invade the dentinal tubules unless the lime-salts have been first dissolved away by acids, and Prof. Mayr claims that the lime-salts are never disposed of in that way. Here seemed to be a dilemma, but Dr. Abbott

thought he could furnish a third leg to that stool so it might present a more reliable appearance. The living substance in the tooth structure was, he thought, like in its various properties to living tissue wherever found. The acids in the mouth must act as an irritant to this organic matter, causing finally a state of inflammation. Inflammation here, as in all living tissue, causes a swelling of the parts affected, enlarging the canaliculi, and thereby crowding out or disintegrating the lime-salts. The Dr. proclaimed himself an advocate of the acid theory only so far as to admit that it was probably the first cause of the irritation which finally brought about the state of inflammation.

In closing, he propounded numerous conundrums which prevented his accepting as correct what is known as the "germ theory." If this theory be correct, he said, why do we find so often strong and beautiful teeth in mouths swarming with bacteria, and where a brush was never known to enter? Why is the decay in a tooth sometimes so extremely sensitive, if the living substance has been eaten out or absorbed by the organisms found there? Again, these organisms gather in greatest numbers in and around deposits of tartar. Why, then, are the lower incisors the last to be attacked by decay, that being where calculus is most abundant?

Dr. Clark replied to some of the statements of Dr. Abbott, advocating with earnestness the germ theory as giving the best explanation of the phenomena of caries, and urged upon the profession a more practical knowledge of the use of the microscope. He thought the time was near at hand when all intelligent dentists would consider necessary, first of all, a careful examination of the fluids of the mouth with the aid of a microscope. He claimed to be able to detect the slightest trace of nitric acid by that means, but said he had never found it present in any mouth. Dr. Clark urges the frequent use of antiseptic washes, and said he had found nothing he considered as effective in the destruction of germ life as carbolic acid. This he used in the form of a solution in glycerine, one part of the crystal being dissolved in three parts of the latter, to which is added eighty parts water.

It was rather late when the meeting closed, but I am sure every one present went home feeling that he had been amply repaid for the time consumed.

The thanks of the Society were tendered unanimously to both Dr. Abbott and Dr. Clark.

The Society will meet again on the evening of the 12th of next month, at the residence of Dr. Van Wart, Noble street, Greenpoint, at which meeting all our friends of the "Journal" will be welcome.

Truly yours, W. H. J.

The seventh annual meeting of the Vermont State Dental Society will be held in the parlors of the Bates House, Rutland, Vt., March 21, 22 and 23, commencing at 7.30 P. M., on Wednesday, the 21st. Return checks free over the railroads. Rates at the hotel, $2.00 per day.

Dr. C. C. Boynton, of Brandon, will give an essay, Wednesday evening, on Bacteria, aided by microscopical illustrations. Other essays are, Evil Effects from Loss of Teeth, by Dr. James Lewis; Dental Education, Dr. S. J. Andress; and Why our Fillings Fail, Dr. W. S. Curtis. Subjects for discussion are, Cases in Office Practice; Regulating Teeth; and Preparing and Filling of Pulp Canals.

The president's address comes, according to programme, on Thursday afternoon, and a banquet, Thursday evening, "to which the ladies are especially invited."

This Society has an active membership of forty-three, of which Dr. S. D. Hodge, Burlington, is president; Dr. E. E. McGovern, Vergennes, secretary, and Dr. R. M. Chase, of Bethel, chairman of the executive committee.

The profession in Vermont, and other States as well, are cordially invited to attend this meeting.

BOARD OF DENTAL EXAMINERS, OF ALA.

The State Board of Dental Examiners of Alabama will hold their third annual meeting in Montgomery, Ala., commencing the second Tuesday (the 10th day) in April, 1883, at the same time and place with the Alabama Dental Association. All parties desiring to practice dentistry in Alabama must make application for license on the first day of session.

T. M. ALLEN, D. D. S.
Sec'y B. of D. E. of Ala.

Eufaula, Ala.

SELECTIONS.

HYDROGEN PEROXIDE AS AN ANTISEPTIC.

According to the *Comptes Rendus*, Mm. Paul Bert and P. Regnard have studied the action of hydrogen peroxide upon various forms of organic matter and upon fermentation, and find that it possesses very remarkable antiseptic properties. All fermentation due to an organized ferment is immediately and definitely arrested by hydrogen peroxide, the ferment is killed, and even after the removal of the hydrogen peroxide by one of the substances which destroys most rapidly, the fermentation does not re-commence. The yeast of beer is in this manner killed instantly, although it possesses itself the property of decomposing hydrogen peroxide. Specimens of wine, urine and milk, each containing a few drops of hydrogen peroxide, have been exposed for several months in open vessels without exhibiting the least sign of alteration ; while other specimens of the same identical liquids, without the addition of hydrogen peroxide, placed beside them, were in a state of complete decomposition. Although organized ferments are destroyed by hydrogen peroxide, the soluble ferments do not seem to be afflicted by it ; saliva, diastoes, the gastric and pancreatic fluids continue to act in solutions containing hydrogen peroxide. Mm. Bert and Regnard have also studied the action of hydrogen peroxide upon various organic materials, including the albuminoid substances and all the tissues composing the animal body in a healthy or pathological state. The results of their investigations may be summed up as follows: (1) Hydrogen peroxide, even when very dilute, arrests fermentations due to the development of living organisms, and the putrefaction of all substances which do not decompose it. (2) It has no effect upon diatose fermentations. (3) Dilute hydrogen peroxide is not destroyed by fats, starches, soluble ferments, egg albumen, casein, the peptones, creatine, cretinine, or urea. (4) It is rapidly destroyed by nitrogenous collagens, by muscatin, fibrin of the blood, and various nitrogenous vegetable matters. (5) This action is definitely arrested by a temperature above 70 degrees. Putrefaction, however, leaves it entirely intact.—*The Sanitary News, Chicago, Ill.*

Dr. Schmidt, of New Orleans, says the Bacillus tubercle is a fat crystal. See *Cincinnati Lancet and Clinic*, of January 13th, if you are interested.

Quotations from the Valedictory Address of S. W. Dennis, Dean of Dental Department of University of California.

The late Professor Austin said: "But few minds can even approach that universality of genius which characterized Hippocrates and Hunter, hence devotion to a specialty of the medical art detracts nothing from the position which a man's talents entitle him to assume."

He further says, "where are we to look for the most valuable contributions to medical science and literature except to those who apply themselves exclusively to some one class of diseases."

. . . .

You came like so much bullion alloyed with some base metal. You have passed through a process of refining, and have received the die of approval, and to-night you are to be received into the profession with all the rights and privileges pertaining to the degree for which you have labored diligently and faithfully.

As it were, you are on this occasion united to the profession you have chosen.

Although you have been refined, and have received the stamp of approval, you will, notwithstanding, have your purity questioned.

Like coin from the mint, you may go to the extremes of the earth, and you may be knocked about or dashed upon the counter to test your purity.

If you are conscious of that purity, and you maintain it, you will always be taken in the end, for your full value, while the counterfeit, when detected, will be cast into the company where it belongs.

Your luster will be dimmed through circumstances over which you have no control, because by the public you are associated with men from whom you receive the deadening and contaminating stain.

But if you maintain the characteristic ring you will be known and recognized by it.

You will find it difficult to compete with practitioners without knowledge.

You will wonder how the counterfeit can so long pass from one person to another without detection, but you must maintain your character, else the detective will begin to make inquiries as to your source, and then your Alma Mater may be scrutinized and possibly condemned.

Youth longs and manhood strives, but age remembers.—HOLMES.

THE

NEW ENGLAND

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ORIGINAL COMMUNICATIONS.

RIGHTS OF DENTAL SURGEONS TO EXEMPTION FROM JURY DUTY.

The following copies of papers now before the Supreme Court of the District of Columbia will perhaps sufficiently explain themselves. The facts which brought about this stage of the case are, if we are correctly informed, as follows :

Dr. Noble was summoned as a "talesman" by the marshal of the District. The judge having refused to excuse him upon the statement that he is a dental surgeon, the following "motion" and "affidavit" were presented, and after a cursory examination of the affidavit, the court expressed a willingness to excuse the Doctor, and refused to fine him.

Acting by advice of counsel and the Washington Dental Society, Dr. N. refused to be excused, and had the case referred to the Court in General Term. Its strength as set forth by "affidavit" and "letter of counsel" seems conclusive, and Dr. Noble and the Washington Dental Society will have earned the gratitude of the profession if they succeed in establishing a governing precedent, something which thus far seems to be wanting.

The question may arise as to whether non-graduates are, or can be, included. It occurs to us that in the several states where the profession has no *special* legal status, the question of what constitutes a

dental surgeon would be determined by common law and would include non-graduates. In those states where special enactments have been secured regulating the practice of dentistry, all whom the law recognizes and licenses as dental surgeons, or dental practitioners, would, by law, have equal claim to exemption from jury duty—if surgeons be by the laws exempt. We give the papers in full, because it is a question of much practical interest to the whole profession, and that dentists may know and be prepared to claim their just rights to exemption as surgeons, with all that the term implies.—Ed.

In the Supreme Court of the District of Columbia.

In re Henry B. Noble. Circuit Court, February, 1883.

MOTION.

Henry B. Noble now comes into this court, this thirteenth day of February, A. D. 1883, and challenges himself as a juror, and moves the court to discharge him from jury duty, on the ground that by the law he is exempt, for the reason that he is a practicing surgeon in the District of Columbia, as shown by the affidavit filed herein, which he tenders himself ready to verify.

HENRY B. NOBLE.

Witness: Geo. F. Appleby.

ORDER OF COURT.

In the matter of Henry B. Noble, praying a discharge from jury duty, because he is a dental surgeon, practicing as such, the motion and affidavit in support thereof are hereby respectfully referred to the Court in General Term, there to be heard in the first instance.

MacARTHUR, *Justice.*

AFFIDAVIT OF HENRY B. NOBLE.

This affiant, having been duly sworn according to law, states that he is a resident of the District of Columbia, a citizen of the United States, over twenty-one years of age and under sixty-five years of age, and has never been convicted of any felony or misdemeanor whatever.

This affiant further states, that for more than twenty-five years he has practiced the profession of a dental surgeon and still practices; that he was licensed to practice said profession by the Baltimore College of Dental Surgery, a college chartered in 1839, by an act of the Legislature of the State of Maryland, from which college he was graduated in the year 1857, having pursued the full course of study there prescribed. That he has a diploma of said college admitting

him to the degree (chirurgiæ dentium doctoris) of a Doctor of Dental Surgery (D. D. S.) That during the session of 1880 and 1881 of said college he delivered lectures and held clinics. That the *curriculum* of study in said college embraces pathology and therapeutics, anatomy and physiology, chemistry and materia medica, oral surgery and metallurgy, as well as operative and mechanical dentistry. That by said studies a knowledge of the pathological relations of the teeth to the other parts of the system is obtained, together with the symptoms, causes and treatment of all diseases which involve the dental structure, such as inflammatory action affecting the various tissues, diseases of the dental pulp, periodontitis, alveolar abscess, dental exostosis, dental caries, necrosis, &c., &c.; that thereby knowledge is obtained to ensure careful attention to the chemistry of metals, and to the vital chemistry of anæsthetics; that thereby knowledge is obtained so as to construct and apply instruments and appliances for correcting irregularities of the teeth or dental arch, treatment of dislocation and fractures of the maxillæ, removal of morbid growths, treatment of ulceration of the tongue and any disease of the antrum. That the text-books used in said college and in kindred colleges are Garretson's Oral Surgery, Kingsley's Oral Deformities, Harris' Principles and Practice of Dental Surgery, Richardson's Mechanical Dentistry, Gross's System of Surgery, Paget's Surgical Pathology, Miller's Principles of Surgery, Gray's, Wilson's or Handy's Anatomy, Tomes' Dental Anatomy, Dalton's, Flint's, Draper's or Kuss' Physiology, Fowne's, Roscoe's or Wilson's Chemistry, Bowman's Practical Chemistry, Wood's Therapeutics, Biddle's Materia Medica, Wedl's Dental Pathology, Beal on the Microscope, and other works. That for said studies, illustrations are made, both upon the living subject and the cadaver, by dissections of the cadaver, and by diagrams, preparations and models.

This affiant further shows, that he has acquired a large practice in the District of Columbia, and has his time during the hours of the day constantly employed by the very exacting demands of his patients, and sometimes the hours of the night. His patients are oftentimes sufferers from excruciating pain, and require immediate surgical treatment for relief. He has constantly on hand what are called "regulating cases." In these it is necessary for him to see at regular intervals the child or young person whose crooked teeth are being regulated or straightened; in some of these cases daily, and in others two, three, or four times a week. The springs or ligatures which move the teeth towards the position they are designed to occupy, require constant

adjusting, and if they are not regularly attended to the patient suffers materially; and if, by neglect to remove them, the enamel should be softened, great and permanent injury may result. The movement of the teeth having been begun, should go on regularly and uninterruptedly, for if the fixtures are not attended to and altered frequently, so as to keep up the requisite pressure, the teeth will in a short time become more or less fixed and tightened where they are, and renewed movement after a time is not only more difficult, but causes much additional pain and distress to the little patient, the most painful part of the operation being the starting of the movements in the teeth. These cases each range in treatment from one to twelve months.

This affiant further states, that cases are constantly occurring in his practice where arsenic has to be used to devitalize a pulp in order to preserve a tooth. In such cases he is required to see the patient at a certain time after the application is made, in order to remove the arsenic and extirpate the dead pulp. If the arsenic be not removed in due time, the tooth will become discolored and an abscess will most probably result, giving rise not only to great pain and discomfort, but to serious and possibly permanent injury and disfigurement, by resulting necrosis of a portion of the alveoli, or even endangering life through the absorption of pus into the system, causing pyæmia.

This affiant further states, that, being in full practice, he is constantly consulted by patients for the treatment of abscesses occurring at the roots of "dead" teeth, of necrosis of the alveoli or any portion of the maxillæ, for treatment of the disease of the antrum, of ulceration of the tongue, of tumors of the gums, of fractures of the jaw and teeth, and in cases of interrupted second dentition. In the last named cases a reflex constitutional disturbance is oftentimes caused by interrupted second dentition, which is overlooked by the medical attendant, and serious nervous derangements have resulted to the young subjects, which have been rapidly cured by the application of local surgical treatment.

This affiant further states, that fractures of the jaw, though not occurring so frequently as fractures of other bones of the body, are liable to be met with at any time, and, when occurring, require prompt, skillful, and continued treatment; and these cases properly belong to the dental surgeon, who has succeeded in their treatment and cure when the resources of the general surgeon have signally failed, as in the well-known case of the Hon. Wm. H. Seward, who was injured in Washington City whilst Secretary of State.

This affiant further states, that teeth, and especially front ones, are not infrequently loosened, and are sometimes entirely knocked out, by accident. The timely aid and special skill of the dental surgeon can replant the teeth when knocked out and render them permanently firm and useful.

This affiant further states, that hemorrhages, resulting from the particular diathesis of the patient and from other causes, frequently follow the extraction of teeth, sometimes immediately and sometimes after the lapse of hours and days. Secondary hemorrhage, when occurring, is known by physicians and surgeons to be more dangerous than primary, and these cases are always treated by the dental surgeon, as he by his special education and study of the detailed anatomy of these parts, is better qualified for their treatment, and when such cases come to the notice of the physician they are generally referred to the dental surgeon. And this affiant further states, that he has constantly on hand, and there is not a dental surgeon of full practice who has not, cases which require continued and frequent treatment and applications of medicaments for days and weeks, governed by the diathesis and constitutional condition of the patients.

This affiant further states, that he has books and pamphlets in his possession or control, some of which are herewith exhibited and filed, by which, it will appear to the court, that his profession is regarded as an important collateral branch of medical science. That the Universities of Harvard, Pennsylvania, Maryland, Michigan, Iowa, Tennessee, Howard, Vanderbilt, and California have instituted and organized, in connection with their medical departments, departments that are known as Dental Departments, which are now in active operation, and confer the degree of D.D.S.; that the American Medical Association has established a section of dental surgery; that on September 8, 1859, by act of Parliament, power was granted to the Royal College of Surgeons to examine candidates for the diploma of Licentiate in Dental Surgery, and to grant that degree; that in the International Medical Congress there is a section for diseases of the teeth or dental surgery, and that Edwin Saunders, a celebrated dental surgeon, is president of the section; that the Congress has been addressed by various eminent dentists from different parts of the world, and all the proceedings are published in the British Medical Journal.

This affiant further states, that, being a regularly-bred and duly licensed dental surgeon, practicing his profession as such, the performance of jury duty would work material injury to his interests and

injury to many of his patients, and to some of them probably serious injury; that he is advised by counsel for the Washington Dental Society, of which he is a member, after mature deliberation by such counsel, that he is exempt under the law from jury duty. That he is advised by said counsel to assert his privilege by a challenge as well as by a motion, supported by affidavit, as herein done. He appends hereto the letter of said counsel, and the other papers herewith exhibited and filed. That he is informed and believes that this court, Justice Olin presiding, has held that a dental surgeon is exempt by the law from jury duty, the occasion being the summoning of Thomas Oliver Hills, D.D.S., to do jury duty.

This affiant further states that he tenders himself ready to verify all the matters herein stated or in the foregoing motion stated, and that the notice and summons exhibited to the court herewith and hereto appended is the notice and summons served on him as in the motion stated.

HENRY B. NOBLE.

Subscribed and sworn to before me, this 13th day of February, 1883.

R. J. MEIGS, *Clerk*,
By J. J. CAMP, *Asst. Clerk*.

LETTER OF COUNSEL.

WASHINGTON, D. C., *February 10th, 1883*.

Dr. HENRY B. NOBLE.

Dear Sir: As counsel for the Washington Dental Society, we are requested to communicate with you as a member of said society, and to give you the result of our research and investigation as to the question whether a dental surgeon, duly licensed as such by a college having the requisite faculties, or by a university, and practicing his profession in the District of Columbia, is exempt from jury duty in this District. You may remember that the late lamented Judge Olin held, in the case of Dr. Thomas O. Hills, a dental surgeon summoned as a juror, that he was exempt from jury duty. The case is not reported, but you can find from Dr. Hills the occasion of the decision and the reasons given by Judge Olin. Our act of Congress on the subject of exemptions, and the only act of Congress on the subject, was passed June 16th, 1862, just about nine months before the Supreme Court of the District of Columbia was organized. It is incorporated in the Revised Statutes of the United States relating to the

District of Columbia, section 875. It is affirmative legislation, and may not have the effect of repealing prior laws making exemptions not therein mentioned, as in the case of The King vs. Pugh, 1 Douglas, 191, where Lord Mansfield, delivering the opinion of the court, said: "We have considered this matter very fully, and we are all of opinion that the statutes relative to juries, being affirmative, do not take away the prior exemption." The only Maryland acts of assembly touching exemptions from jury duty, which were passed prior to February, 1801, when Congress passed the act adopting the laws of Maryland then in force, were the acts of 1715, ch. 37, § 4, and 1797, ch. 87, § 6, neither of which related to physicians or surgeons. It is remarked by Chancellor Kilty, of Maryland, in his report to the Maryland Legislature on the British Statutes, in force in the provinces, page 230, that the statute of 5 Hen. VIII., chap. 6 (1513), although in its terms applicable only to surgeons of London, is supposed, together with others respecting physicians, to have extended to the kingdom generally." It is stated in 3 Bl. Comm., 364, that the exemption from serving on juries is extended by divers statutes, customs, and charters, to physicians and other medical persons; and Kilty says: "It has not been the practice to summon them on juries in the province or in the state, although they are not exempted by the act of 1715, ch. 37, from which it may be inferred that these statutes extended to the provinces." Chancellor Kilty was the Chief Justice of the Circuit Court of the District of Columbia. His report on the British Statutes, exisiting at the time of the first emigration and by experience found applicable, was printed and distributed under the sanction of the state for the use of its officers, and is a safe guide, says Judge Buchanan, delivering the opinion of the court in Dashiel vs. Attorney-General, 5 Harris & Johnson, p. 403; and Alexander, in his collection of British Statutes in force in Maryland, p. 277, says that surgeons, physicians, and other medical persons are not even exempted from jury service by the Maryland Code, but that they are exempt, as it is presumed, by force of these early statutes. Alexander gives in full the text of act of 5 Henry VIII., cap. VI., as being still in force in Maryland, and thereby surgeons are exempt from jury duty and also barber surgeons. Letters-patent were granted in first year of Edward IV. to the freemen of the mystery of barbers using the mystery or faculty of surgery, by which they became a corporate body. In the 32d year of Henry VIII., as there were two distinct companies in London "occupying and exercising the science and faculty of surgery," the one company

being called "The Barbers of London" and being incorporated, and the other company being called "The Surgeons of London" and not being incorporated, both companies were united and made one body corporate by act of Parliament, 32 Henry VIII., cap. 40, and called by the name of "Masters or Governors of the Mystery and Commonalty of Barbers and Surgeons of London," and they were made exempt from inquest duty. It was enacted by the same act, that "no manner of person within the City of London, suburbs of the same, and one mile compass of the said City of London, . . . shall occupy any surgery, letting of blood, or any other thing belonging to surgery; drawing of teeth only except." And surgeons within the same limits were forbidden to "occupy" or "exercise the feat or craft of barbery or shaving." The said corporation of barbers and surgeons continued until 18 George II., when the surgeons and barbers were made two separate and distinct corporations, reserving the privileges each were entitled to under Stat. 32 Henry VIII., to each company severally, vide Stat. 18 George II., cap. XV.

The barbers continued to have the same privileges after 18 Geo. II. as before, "so far as the same do not concern or relate to the art and science of surgery," and "with respect to everything but surgery." The surgeons so continued to be incorporated till 1800, when the Royal College of Surgeons was established. As the statute of Henry VIII. allowed the barbers to continue in one part of surgery, the drawing of teeth, and prohibited them from practicing every other part of surgery, even treating the diseases of the teeth, the barber, who was a mere tooth-drawer, so far as surgery is concerned, after the act of Henry VIII., chap. 40, was not, it would seem, allowed to practice this part of surgery after the act of George II. for reward or compensation. Thereafter dentistry as a specialty in England arose and has made such wonderful strides that Parliament, in 1859, recognized dentists as surgeons, and granted authority to the Royal College of Surgeons to give diplomas in Dental Surgery. Dentists were not barbers, as has been vulgarly supposed, although barbers were at one time surgeons. The modern dentist was a surgeon from the start and after the surgeon had ceased to be a barber. He draws teeth, it is true, but he draws them very seldom, and only when absolutely necessary. He is not a destroyer or extirpator of teeth. He is a preserver of them, as was the ancient dentist, so intimately acquainted with their structure and organism that he can replant them when necessary, and even transplant teeth from one person to another. He understands

all their diseases and the treatment of them, and all the diseases of the oral cavity and their treatment.

The barber, whilst a mere tooth-drawer in surgery, was exempt from jury duty, and it would seem from Comyn's Digest—Title, Challenge A 4, *in notis* American edition, that as soon as he ceased to do the only surgery allowed him by the act of Henry VIII. (*supra*), to wit: the drawing of teeth, he ceased to be exempt from jury duty. The surgeon was, also, exempt as we have above seen. The policy of the exemption was on account of the inconveniences and possible hurt or even danger to the public by reason of the absence from their professional duties of persons specially skilled in any part of the healing art. The act of George II. exempted surgeons, after their separation from the barbers, from all "parish, ward, and leet offices, and of and from the being put into or serving upon any jury or inquest," and provides that any surgeon summoned and returned to serve on a jury "shall be absolutely discharged from the same," and the return "shall be utterly void and of no effect."

The act of 6 George IV., c. 50, § 2, specifies the persons exempted from jury duty and declares that their names shall not be put upon the jury list, and, among others, "all surgeons being members of one of the royal colleges of surgeons in London, Edinburgh, or Dublin and actually practicing." Now, it was an inconvenience to the public and a hardship on the dental surgeon that he should not be exempt from jury duty when he was recognized by Parliament and by the Royal College of Surgeons as a surgeon, simply because he might not be a member of one of the royal colleges of London, Edinburgh, or Dublin. This patent incongruity in the law was corrected by Parliament by an act passed July 22, 1878, entitled "An act to amend the law relating to dental practitioners." It provides first for the registry of persons qualified to pursue the profession of dentistry, and then enacts as follows: "Every person registered under this act shall be exempt, if he so desires, from serving on all juries and inquests whatsoever, and from serving all corporate, parochial, ward, hundred, and township offices, and from serving in the militia."—(Law Reports, Stat. 13, page 269.) This act clearly shows that dental surgeons are within the classes of persons which it is within the policy of the law to exempt. At the annual meeting of the Metropolitan Counties' Branch of the British Medical Association, held at Crystal Palace in July, 1881, Edwin Saunders was elected president in place of Sir Henry Thompson, and in the course of his address, said: "Concur-

rently with a rapid and brilliant advance in the science and art of dentistry, due to a large extent to a wave of progress which reached this country from America, there arose an increasing demand for and an appreciation of its services on the part of the public." He was speaking of a time before the year 1860, and then speaking of the want felt after that time for a registry as a check to the intrusion of the unprincipled and uninstructed, he says: "This has now been happily accomplished by the dentists' act of 1878, and thus legislative sanction has been obtained for a scheme not directed to give prominence to the educated and qualified few, but to raise the whole body of the profession; not to accentuate the distinctive character of the specialty, but indissolubly to unite it to the great surgical body through the examining board of the Royal College of Surgeons." Dental surgery has a section in the International Medical Congress. It has, also, a section in the American Medical Association. The universities of Maryland, Michigan, Pennsylvania, Iowa, Tennessee, California, Vanderbilt, Howard, and Harvard have organized in connection with their medical departments, as you well know, departments known as dental departments, and confer the degree of D. D. S. We know that in England before 1862, the date of the passage of the act of Congress, the dental surgeon was treated as a surgeon and dental surgery as a branch of surgical practice, and this was due, said Professor Saunders, to "a wave from America." In this country, therefore, prior to 1859, when the act of Parliament was passed giving the Royal College of Surgeons power to grant diplomas in the specialty of dental surgery, the dental surgeon was recognized as one having not only a professional standing, but as having a specialty duly recognized as a part of medical science. In this condition of things the act of Congress of June 16, 1862, was passed, and in 1874, § 875 of the revised Statutes D. C. was enacted, whereby it is provided that all practicing physicians and surgeons shall be exempt from jury duty. Can it be said that a dental surgeon in 1862 or 1874 was not fully recognized in this country as well as in England as a surgeon?

The act says all surgeons shall be exempt. Who is a surgeon? What is a surgeon?

There is a current idea that a surgeon is one who cuts and carves the human frame, and hence the words scalpel of the surgeon are so often found in alliterative company, like the words pallete of the painter, sword of the soldier, or brief of the barrister. The word surgeon does not necessarily imply the idea cutting, for, if so, the lithotritist

would not be a surgeon, although the lithotomist would be and is a a surgeon. The word *surgeon* is derived from the old French *surgien*, which is a contraction or rather corruption of *chirurgien* (the chi being pronounced she in this word in French), which is made up of two Greek roots signifying "hand" and "work," and is applied to one who practices "that part of the healing art which relates to external diseases and their treatment, especially to the manual operations adopted for their cure." (Worcester.) See, also, to the same effect, Webster, Jacob's Tomlin's Law Dictionary, Dunglison's Medical Dictionary and Cooper's Surgical Dictionary. The lithotritist, although he may be a surgeon of greatest skill, is not likely to have the same skill for the diseases of the ear or eye, of the teeth or throat, as the aurist or oculist, as the dentist or laryngoscopist, and is not the less a surgeon because he refers to the laryngoscopist all cases where the throat is diseased, to the dentist, where the teeth or oral cavity are diseased, to the aurist where the ears or contiguous parts are diseased, and to the oculist where the eyes are diseased. If the aurist be a surgeon, and he is so described in the dictionaries, is he less a surgeon because he lets the lithotritist grind a stone or the embryotomist crush a fœtus? If the oculist be a surgeon, and he is so described in the dictionaries, is he less a surgeon because he lets an ovarian tumor be removed by a specialist in that line? If the laryngoscopist be a surgeon, and his cunning is so new that he is not as such mentioned in the dictionaries, is he less a surgeon than his older brother the dentist, who is old enough to be described in the dictionaries, and who is described therein as a surgeon, because the surgery of the teeth and adjacent parts are by him, the laryngoscopist and all the other surgeons, confided to the dentist?

We think the dictionaries well describe aurists, dentists, and oculists to be surgeons. We look at Worcester and we find: Aurist, "a surgeon who treats diseases of the ear;" dentist, "one who devotes himself to the study of the diseases of the teeth and their treatment; a surgeon of the teeth, called also dental surgeon and surgeon dentist;" oculist, "a surgeon who occupies himself chiefly with the management of diseases of the eye."

We think that when the act of Congress says all surgeons shall be exempt, it cannot be successfully maintained that some surgeons are not exempt, and especially that some such surgeons as it is the policy of legislation to exempt, are not exempted. It would have been wiser to particularize the surgeons to be exempted, and select only such

surgeons as have been licensed by some standard college or university, as Parliament has done ; but we are dealing with the act as it is, and not as it ought to be. We think that you are exempt, and that His Honor Mr. Justice MacArthur will permit you to test the question in the court in general term. Assert your right to exemption by challenge and motion, supported by affidavit.

Yours truly,

APPLEBY & EDMONSTON.

Postscript.—In this matter, we have many additional points in your favor, which we will present for argument when the time arrives. For instance, the Interior Department has treated the dentist as a dental surgeon, and we herewith transmit a printed copy of the correspondence between the Census Bureau and Thomas B. Gunning of New York, wherein Dr. Gunning was successful in resisting the attempts of the Census Office to have dentists make a return of matters appertaining to their profession. We also transmit herewith a list of physicians and surgeons of New York wherein the name of Dr. Gunning appears as a D.D.S., Baltimore College of Dental Surgery. The State Department in 1866 appointed Dr. Gunning one of a board of surgeons to the Paris Exposition. There are many points which we have not time now to mention, such as Mayhem, and appeal of Mayhem in cases where front teeth are knocked out by assault and battery—showing the value which the common law placed upon teeth. The reported cases show the degree of responsibility to which a dentist is held, and they all proceed upon the idea that he is a surgeon and ought to be held to the same accountability. If we have an opportunity to argue the matter before the court, we can make it plainer than by writing a letter in the haste now required.

Yours truly,

APPLEBY & EDMONSTON,
Per GEORGE F. APPLEBY.

ATTACHMENT OF ARTIFICIAL CROWNS TO NATURAL ROOTS.

BY H. W. F. BUTTNER, D.D.S., NEW YORK, N. Y.

The reviving interest of the profession in this exceedingly interesting subject has caused the improvements of setting crowns and a rapid development of new processes.

In revewing the numerous methods which have been practiced and those that are at present in use, it would seem useless to enter upon this so thoroughly exhausted field and try to make an improvement. But I firmly believe, and many will agree with me, that the average result of crown and pivot operations should be more successful.

The desirable fact that a root, if properly treated and filled, can last for years, is surely worthy of the most careful attention. No effort, no skill should be spared to restore this, in a great many cases invaluable remnant, to full usefulness. We are destined to imitate nature, relieve suffering, and restore lost or crippled organs, and in none of the various duties of our profession can we accomplish a more gratifying result than in the restoration of lost crowns.

I admit that at all times there have been *some* who have recognized the value of such an operation, and exercised their greatest skill upon it; but the greater majority do not appreciate it, and prefer to dispose of it in the easiest possible manner. In the interest of the dental profession, I trust that the recent movement, which points towards a radical reconstruction of setting crowns on natural roots, will deeply interest every member, and invite them to give it the most careful attention.

An observer will not escape the fact that the many failures of pivoting operations are due to a wrong principle. Although pivots of every conceivable material have been applied, they sooner or later gave away under the pressure of mastication. The roots decay at the margin of the gum because a perfect joint between root and artificial crown is rarely obtained, and a great many split and crumble away untimely on account of being hollowed out excessively to gain room for cement, amalgam or gold to hold the artificial crown with pivot in place. The question is naturally forced upon us whether the result would not be more satisfactory if the root could be kept at full strength, the joint between root and crown made always impervious to moisture, and the pivot made a secondary means of attachment.

Few have recognized the importance of strengthening the attachment by a ring fitted around the neck of the tooth. Although this invention is by no means of recent date, it is only a short time since it has

become generally known. To protect the end of the root from decay, and to obtain a strong hold for an artificial porcelain crown, a gold band properly applied must be of the greatest benefit, providing the ring encloses the neck of the root in such a manner as to really serve as a strong attachment without the unreliable aid of cement or any plastic filling material; that it serves as well, at the least, as a perfect gold filling, absolutely moisture-tight and destined to prevent further decay of the root. These points cannot be obtained unless a method is applied which is based upon true mechanical principles.

I have for several years taken a particular interest in setting artificial crowns on natural roots. It always appeared to me that it would be an inestimable benefit to the profession to possess a method of attachment which would combine strength, firmness and durability, and preserve the exposed end of the root from further decay.

During the year 1879 I entered the New York College of Dentistry as a demonstrator, and from that time had ample opportunity to practice my method of setting crowns. Although my first operations were performed with very imperfect instruments and appliances, they have stood the test remarkably to the present time. Up to the year 1882, when I resigned my position in the college, I had performed nearly three hundred of these operations, of which two-thirds were done at the college. Since then, I have made it a specialty, and set hundreds more for prominent practitioners and in my own practice. Failures that could be attributed to imperfection of the method have never come to my knowledge, and only a few having been lost through accident, viz: breaking of porcelain face, etc. The above facts, in connection with the thorough reliability of the system, lead me to believe that I have found a device covering fully every important point in the setting of crowns.

Fig. 1.

To protect the root from decay, and to obtain a strong hold for an artificial crown, I apply a gold cap. The neck of the root is prepared by a set of instruments especially constructed for that purpose. These instruments enable the operator to obtain as nearly perfect adaptation between the gold cap and root of the tooth as can possibly be made. With reference to the upper centrals, laterals and canines, as well as the corresponding lower teeth and bicuspids, there can be nothing more favorable than the application of this method. The extension of this process to the upper bicuspids and molars, although possible, is not as advantageous.

With these instruments, a circular shoulder is turned on the neck of the root.

The alteration of the neck of the root, from an irregular cone to a cylindrical form, enables us to adapt a corresponding ring or cap. Such a cap, when fitting accurately around as well as upon the end of the root prepared by these instruments, forms an air-tight joint and consequently protects it from decay, at the same time giving the porcelain crown, when attached, a firmness which heretofore has never been obtained. The set of instruments by which the neck of the root is prepared consists of drills, reamers, and trephines. The drills (Fig. 2) are used to enlarge the root-canal for the guidance of the reamer or facing instrument and trephine. The reamers (Fig. 3) cut the surface of the root down as far as necessary. They produce a perfectly level surface and have a center-pin, which corresponds with the hole made by the drill in the center of the root, and acts as a guide. The trephine (Fig. 4) has also a center-pin, and is used to make the root cylindrical below the free margin of the gum. A set of these instruments includes different sizes of drills, with reamers and trephines corresponding in size adapted to various diameters of roots.

FIG. 2. FIG. 3. FIG. 4.

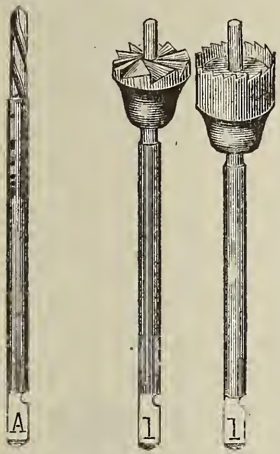
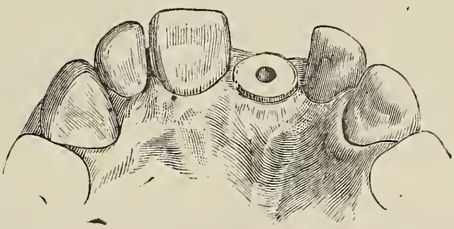


FIG. 5.

The ferrules or caps (Fig. 5) to fit roots which have been prepared by the above instruments are of gold, made by steel dies. They correspond exactly with the trephine in diameter and depth with allowance for sufficient expansion of the gold when forced on to the shoulder of the root, whereby a most perfect joint between cap and root is obtained. They have a stout central pivot which fits the hole in the root and gives increased strength and firmness.

FIG. 6.

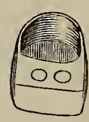


The pulp-canal is enlarged with one of the drills selected with reference to the size of the root. A reamer corresponding in size is used with the dental engine to cut the root down to a perfect level. The trephine is applied in the same manner to give a cylindrical form to it, thus completing the shoulder (Fig. 6).

A steel wire corresponding in diameter with the drill which has been employed is now introduced into the root, projecting out about half an inch. It serves to indicate the exact direction of the root-canal. An impression cup is selected with an opening opposite the missing tooth to take an impression of the root and adjoining parts. The object of the opening is to give free transmission to the wire in the root-canal. The wire protruding through the cup and impression-material is drawn out carefully before the removal of the impression-cup, which is then removed and the wire placed in its proper position in the impression. A set of brass root-models (Fig. 7) corresponding in size with the instruments accompany them; one of these, bearing the same number as the instrument with which the root has been prepared, is now placed on the wire in the impression, and serves to represent the prepared end of the root on the model. The impression is now ready to be filled with plaster. After the cast is obtained, we find the root-model imbedded in the plaster and the wire in its center-hole. The wire is now removed and the plaster cut from around the root-model to the depth of the gold cap, which is ready to be placed upon it. A plain porcelain tooth (Fig 8), as used in plate-work, is ground hollow on the inner surface to cover the outer front wall of the cap, thus hiding the gold. Thin platinum backing is now adapted to the tooth, which is then ready to be placed in position on the model over the gold cap, and fastened thereon with hard wax. The united parts are removed carefully from the model, invested in sand and plaster, and soldered. After polishing, the cap is ready to be forced upon the root by placing a piece of wood on the cutting-edge of the tooth and driving it home with a mallet.

Fig. 7.

Fig. 8.



NOTE. Particulars regarding the sale of complete sets of the above instruments and gold caps will be shortly announced in the advertising columns of this journal.

FORMULA FOR A TOOTH WASH.

Carbolic Acid, ʒij;
Alcohol, ʒvj;
Oil Peppermint, ʒi;
Sol. Red Aniline, gtt. v.

Five to ten drops to be used in a glass of water.—*British Journal Dental Science.*

EDITORIAL.

VIEWS ABOUT DECAY OF TEETH—OLD AND NEW.

Hippocrates, about 400 B. C., drew the attention of doctors to some diseases of chest, neck and ears, the proximate causes of which he thought to be in bad teeth, and which could only be cured by extraction. Also, the seasons seemed to him to have influence over the teeth. He tries to destroy the humors stagnating and accumulated in these organs by means of certain masticatory drugs.

Galenus, about 100 B. C., informs us, first, that the teeth have soft nerves, because they are naked bones and in union with the tongue, and the other soft portions of the oral cavity contribute to the sense of taste. From him we learn for the first time the doctrine of continual nutrition of the teeth which takes place in proportion to the wear. Two abnormal conditions may result from that fact, namely, deficiency and excess of nutrition. The former makes the teeth weaker, brittle and tender. Excess of nutrition causes a kind of inflammation similar to that in the soft tissues. No remedy exists for the first difficulty, as the deficiency in nutrition not only causes teeth to shrink, but also enlarges the pulp cavity ; it is a disease of aged persons. The excess of nutrition is found more frequently in younger persons. The deficiency of nutrition one meets in some measure by astringent drugs ; the excess of nutrition and the acid, stomachic juices, by bitter tonic remedies. Discolored teeth ought to be treated with drying substances.

A long night of almost absolute intellectual darkness follows during the reign of a fanatical priesthood.

By order of the German Emperor, Louis IV., in 1315, Mondini performed the first public dissection of a corpse, which had to be repeated every five years.

Mondini, Professor of Bologna, is the restorer of anatomy ; he wrote an anatomical hand-book, which for two centuries had a classical authority.

Some noteworthy investigations were made by Paul of Aegina, 636 A. D., who in time of general barbarism lived alternately in Rome and Egypt. He advises, for the preservation of the teeth, to guard against deterioration of the food from indigestion, because that causes frequent vomiting, which is very hurtful to the teeth. Therefore, he forbids the use of dry figs, very cold food, etc.

Ebu Sina, or Avicenna, about 1000 A. D., was an adherent of the

vital theory. From violently pulsating pains he diagnosticates excessive moisture at the root of the tooth. He drills into the tooth so as to empty it, and to bring the remedy immediately to the diseased spot. Narcotic remedies often ruin the teeth. Against the worms, supposed to live in carious teeth, he advises the seeds of stramonium, garlic and onion.

Alex Beneditti, Professor at Padna, 1506, in enumerating the causes of caries, thinks he has to accuse the use of milk. He is the first writer who mentions the effect of quicksilver on the teeth, from internal and external use.

Capivacci, 1617, cautioned against sudden changes, such as the use of warm and cold food, as nature cannot bear such sudden changes. In mercurial treatment of syphilis, the patient, as soon as an effect in the oral cavity is shown, should carry a piece of gold in the mouth, because the quicksilver adheres to the gold with its particular sympathy.

Claudius Deidatus, about 1600, surgeon of the Bishop of Basel, asked Hildiani, physician of Bern in 1634, what treatement he ought to employ for a nun who had the rheumatism in the right side of the head, and consequently had such violent pains that she even tried to ease them with nitric acid. Thereby she ruined all her teeth, and even the jaw bone commenced to die. A suddenly cured rash of the head seemed the first cause of the trouble, which became changed into melancholy, with digestive troubles; therefore (!) bad humors were probably the proximate cause of the fluxion.

Hildani himself, in order to kill the nerves in carious teeth, recommends nitric or sulphuric acids, but mentions that, if repeated too often, they ruin the teeth.

Musitanus, Professor of Naples in 1714, says that the worms in teeth grow from their peculiar eggs which the flies and other insects deposit on the food, and these, remaining in the cavities, are hatched by the warmth of the mouth.

In 1728, Peter Fanchard, the famous Paris dentist, the restorer of the dental art, as the French call him, writes in his works about many things which may interest the dentists. He puts himself to much trouble to prove that the worms were the cause of toothache in carious teeth and in salivary calculus, without ever having found them. He supposed all diseases of the teeth to have an internal and external cause. They first attack the external as well as the internal surface. The caries produced by external agents acts on the enamel only.

Kraütman, 1738, says: If by any increased supply of acid lymph

the teeth are corroded and become carious and soft, there is no other cure except pulling them out. The ferment of acrid lymph in the cavity would never lose its strength. Against the supposed worms in dead teeth, he uses the leaves of the "sadetree," boiled with wine, which "smiteth" them together with the bad humors. Acids and cold food are most hurtful to the teeth.

Pfaff, 1755, says the teeth are nourished by arterial blood. If this is diseased, the teeth will suffer. To explain the fact why the upper teeth become destroyed sooner than the lower, he asks: Might not the proximity of the upper jaw to the acrid humors in the nose be the cause?

Ovelgrün, in 1771, claimed that strong tea and coffee were the cause of the prevalence of carious teeth, and that the supposed tooth worms were nothing but the seed of stramonium, used for relieving the pain.

Pasch, in 1767, considered sugar very hurtful to the teeth on account of its preparation with lime, and lime, he says, contains a peculiar corrosive acid that destroys the teeth as well as other bones. (!).

John Hunter, in 1780, said that caries of the teeth does not arise from an external injury by the dissolving action of any liquid, but it is a disease that has its origin in the teeth.

Thomas Bell, 1835, thinks that inflammation is the cause of caries. He explains the fact that caries arises on the outside of the enamel by supposing that, being most remote from the nutrient nerves and vessels, it would be least able to resist. The name caries he considers wrong, and he calls it gangrena. Bell also disputes that the breaking down of artificial teeth is analogous to caries, and that caries is produced by external causes.

Landerer, 1837, says that the teeth are not organized and that caries is nothing but a chemical process of decomposition by the liquids of the mouth, and proves that human teeth attached to artificial dentures sometimes show a kind of caries which is like the ordinary one.

Ficinus, 1847, explains the cause of caries by his new theory of parasites. It is a process of putrefaction which is caused by "germs" in the mouth. He supposed these "denticolæ" to originate from the joining of the so-called Buhlman's fibers, which are nothing else but the fibers of leptothrix buccalis. The process of putrefaction, started by the "denticolæ" (tooth germs), attacks first Nasmyth's membrane, which becomes brownish or black; later, he says, it affects the enamel.

Klenks, 1850, thinks that a "phytoparasite"—protococcus den-

talis—softens and destroys the dentine and feeds on its chemical elements.

J. BRUCH, 1852, says the following are causes: 1st, hereditary; 2d, acquired; and, 3d, endemical in consequence of bad air, water, clothing and food(!!)

E. NEUMANN, 1860, indorses the vital theory. The injurious substances act on the dentine as an irritant, and as a result of it, a decomposition of the tissues follows. The fibrils in the canaliculi become inflamed, the lamels become thicker at the expense of the basis-substance, and at last the canaliculi become obliterated.

BRIDGEMAN, 1863, tries to explain caries by electro magneticism.

MAGITOT, 1867, declares caries as a mainly chemical process. He accuses the acids in the saliva and food of producing it; he also produces artificial caries by allowing acids to act on the teeth for a certain length of time.

HERZ, of Berlin, repeated the experiments of Magitot, but he could obtain nothing but a brownish-yellow coloration of the dentine, and because he could not find in the canaliculi any thing deviating from the normal, he inclines to the view that the change in the teeth in ordinary caries is due to a vital process.

LEBER and ROTTENSTEIN, 1867, by their observations of caries, found that the canaliculi were dilated and filled with leptothric bucculis. They could not detect its presence in hardened dentine and enamel. But, as the resistance of enamel and dentine is reduced by the softening action of acids, the fungi enter into the interior of the dentine and by their growth, chiefly in the dentine, may hasten still more the advancement of the process of softening and destruction than the simple action of acids could do.

WEDL, 1870, believed that the carious process arises from the sour secretion of the gums, which in children, young persons, women—particularly during pregnancy—is secreted in excess; in consequence of this increasing secretion, the carious process in young persons is more acute, while during old age it is more chronic. He has never seen the leptothric buccalis in caries, so that he thinks that they have no direct connection with the origin of the caries. In chronic cases the granules of "leptothric" are nothing but finely distributed fat in the canaliculi.

BAUME, 1877, explains caries as a chemical process produced by the influence of certain acids and sour liquids of the mouth, the use of sour fruits, wines, beverages, mineral waters, etc.

Our readers are familiar with the latest fierce fight between the acid and word-chemistry men (Watt, Tafts), inflammation-school (Drs. Abbott, Atkinson, Boedeker), and germ theory-investigators (Dr. Miller, Underwood, Clark, Stockwell).* Take your choice, gentlemen ! !—D. W.—*Extracts from the German of Dr. McSchlenker.*

IN STORE FOR DENTISTS.

We don't think we are betraying confidence in giving to the profession a part of a private letter from Dr. Jno. M. Riggs, of Hartford, Conn. We make the venture at the risk of a scolding from the Doctor, because we wish to inform the profession what is in store for them. Dr. Riggs is now engaged in writing a treatise on Pyorrhœa Alveolaris, its etiology and treatment (and who can do so better than the man for whom the disease is frequently called? and we would like to see it called by nothing else than Riggs' disease, which is simpler, easier, and in fact compliments the man who called the profession's attention to it, and has been so active in its treatment).

But to get back (the above was not written, Doctor, to prevent the scolding), Dr. R. says : " Besides, my purpose now is to give a minute history of the discovery of anæsthesia in the same volume. As I knew both Wells and Morton quite intimately, it will be conceded, I think, that much corroborative testimony as to Wells being the true discoverer will be forthcoming. Nothing but succinct affidavits have ever been published in Wells' interest, leaving much collateral evidence in my possession which will clear up the whole subject in dispute. Wells' discovery preceded Morton's claim by one year and eight and a half months. It being on the morning of the 11th of December, 1844, that the first experiment was made, after canvassing the possibilities and probabilities of success, until near midnight the previous evening, in my office. On that morning (the 11th December) one of the grandest discoveries must be written up to the credit of the dental profession, when, for lack of a patient, the discoverer submitted himself to the crucial test of success or failure (I might say life or death), by inhaling protoxide of nitrogen until total insensibility supervened and all nerve sensation was hushed to sleep, while it fell to my lot to extract a molar tooth without movement or pain to the patient.

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*Those who recognize the presence of germs in decayed teeth as well proved, seem to be split up into the germ-inflammation adherents (Dr. Abbott?) ; acid-germ, Dr. Miller; germatony, Drs. A. & B. ; while others (Dr. Stockwell, etc.,) consider the germs as most important, and the other changes as more secondary.

"Morton dates his claim for the use of sulphuric ether about the middle of September, 1846, averring that Wells' claim had lapsed by disuse. But my books show continued use up to his ether claim, and, indeed, up to a few years ago. Morton was a student of Wells and was set up in business in Boston by Wells a few years previous to the latter's discovery."

The above is quoted from the *Southern Dental Journal*, to all of which we give vent to a good, old fashioned, Methodistic "*Amen*." Our only wonder is that Dr. Riggs has not done this before. He has in his sole possession too many facts for history to "go hence," without first having put them on record for the benefit of the future. And then, who among all the profession will not want a work on "Riggs' disease," by Riggs himself? We sincerely hope for an early issue of the work.

DR. J. L. WILLIAMS ON LIFE AND VITALITY.

In the December *Cosmos* there appeared a very interesting article by Dr. J. L. Williams on these two difficult problems. We are glad to notice that Dr. Williams himself has found that the term vitality is used very vaguely in almost all cases, but he thinks that it is defensible. Now, we always belonged to the most determined aggressors of the vague term, but we do not belong to those aggressors whose principle it is to destroy as much as they can, but rather to save as much as they can.

We are right glad and willing to accept everything acceptable. We agree perfectly with Dr. Williams in his attack on "chemical affinity;" it is nothing but another such word which is very convenient, but really does not explain anything. We cannot deny ourselves the pleasure of printing the excellent passage:

"Properties should never be mistaken for entities. Chemical affinity or gravitation does not draw atoms or aggregations of atoms together. They are only abstract expressions by which we indicate something of the *qualitative* relationships of matter. Herein lies the error of the materialist; he is constantly mistaking the *method* by which matter under certain conditions acts, for the *cause* of the action; and he persistently refuses to recognize the fact that man's consciousness is related to the phenomena of life as exhibited in matter by a very narrow scale of three degrees,—touch, sound, and sight; the other senses being only modifications of the first. A low degree of motion we call the sense of touch; that motion increased, our

consciousness recognizes a new quality which it calls sound; still further augmented, it speaks a second time through the sense of touch as heat; a more intense action reaches consciousness as light, and then, as the brain is unable to report more than 800 billions of vibrations in a second, the activities of matter pass beyond the scope of our consciousness surrounded by a halo of intense violet light. Above and below this narrow scale roll the infinite tides of life. Inasmuch, then, as man knows so little of the purely material aspects of life, it behooves him to be exceedingly careful in making statements which imply that he has taken into the account all of the qualifying conditions."

We notice an immense advance in the position of Dr. Williams. He expresses his ideas in a much clearer and preciser form, and we are able not only to get at what he means but also to largely agree with him. We fail, however, to understand what he means in the sentence: "Any theory of the origin of any form of organic existence which fails to recognize the subjective conditions of life must end in darkness and confusion." We have to accept sentences like: "Every careful observer knows that there is something in an organism which sets at defiance and sometimes wholly frustrates what we call chemical affinities," if we accept "chemical affinities," but personally we accept that term as little as vital force. We consider the author to be one of the most assiduous thinkers on the subject of vitality, only he has a slight inclination to what might be called the reverential and pious aspect of the whole question, which, to our conception of stand-points, is historical and already passing away in the natural course of the brain-development of man. In moments of poetical enthusiasm we also feel inclined to admire the grand and marvelous adaptation of organs to most complex ends by simple contrivances, but while there are hundreds of points which arouse our astonishment, there are hundreds of other points which fill us with disgust. The whole sentimental aspect of the subject is evenly divided between the admirable and the disgusting, and we can not do anything else but leave it out in scientific discussions of the matter. We try to explain and explain until we are compelled to stop, and then we say candidly, I don't know! But to say, I do not know, before that is needed, would be indolence. We can accept the term vitality as the sum total of all forces, but not in the meaning of an entity in itself; vitality is a resultant, and the efforts of all investigators and philosophers since the commencement of the world were directed towards the decomposion of the resultant into its components; from the writer of the Pentateuch down to Hæckel all

philosophers have tried to solve the problem. The first one got only two components, body and soul. The latter has recognized the principle that every organ, nay, every speck of the human system, has to be analyzed, explained and treated in a most thorough, dissecting, searching manner.

While in a general way we can give two large components of the resultant, called life: internal structure and external circumstances, each of these components consists of innumerable small components, and the more we analyze each, the nearer we are to a solution of the given problem. A steam engine appears a unit to the uncultivated savage; to one a little more educated, it appears a simple machine—"nothing but boiler and wheels"—while to the builder, it is a problem of great complicatedness; to the scientist, who tries to give an exact theory of it, though he may know ever so many details, it is a problem which he can only approach, but never absolutely figure out. The very same holds good with vital forces. The higher we stand in our education, the more will we be able to explain life; the more will we decompose it into factors; the more will we understand it without ever reaching an absolute solution of the problem.

To carry our comparison still further, Dr. Williams appears to us as the analyzing artist, who analyzes the problem from principles of the beautiful and admirable rather than of the purely mechanical and mathematical, which latter stand-point we prefer. Both may get excellent points in their conception of the subject, and yet experience great difficulty to agree and understand each other. M.

DR. LESTER CURTIS AND HIS FIGURES.

In the last excellent article of Dr. Lester Curtis on Some Fallacies concerning the Bioplasson Theory, he attacks very much the size of the drawings of Heitzmann's reticulum in his work. This seems to us rather unfair. To tell the size of the meshes, as determined by the naked eye, is just like the problem to tell what is the apparent size of the moon: some say as large as a hat, others one foot in diameter, a cart wheel, etc. If we attempt to draw the net-work the size we really see it, what would we get practically?—muddy drawings, too small to be clearly cut and reproduced; we are forced to magnify without changing the proportion by our magnifying. If we look through a telescope and observe the starry sky during the night in the neighborhood of the milky-way, we see an immense number of stars

in the field of the instrument; but if we should attempt to draw them with apparent sizes and interstices, the practical execution would meet with such difficulty that from simple necessity we have to adopt a different scale. We see stars that have less than $\frac{1}{100}$ of a second in diameter, even in the largest magnifying glass. Will Dr. Curtis advocate that the drawing of such dots would be a deception, because we would have to make the stars, say as large as the finest point we can print, which is still at least fifteen seconds or 1,500 times larger than the stars seen. The spaces between two stars which we can distinguish are less than one second. We can simply not represent in print and in drawings distances as small as these without enlarging, and what holds good in our seeing with the telescope, holds also good with the microscope; and all such figuring from drawings, that from the very practical necessity of the cause, have to be enlarged, seems to us, if we may be permitted to use the expression, sophistical. When Dr. Curtis figures the size of lines which he allows as possible to be seen to $\frac{1}{143528}$ of an inch, and thinks that while we may see these lines, we might not see, say $\frac{1}{143529}$ of an inch, his figuring becomes perfectly untenable. All these prophets who tell us what we will and can see, are false prophets. If we magnify with lenses properly and perfectly made, we may apply rather the following calculation: We can see a piece of wire $\frac{1}{20}$ of a millimeter thick without difficulty with the naked eye. If we apply a microscope with 2,000 magnifying power and sharp defining power, both of which are practically feasible, we get $\frac{1}{1000000}$ of an inch; hence, about lines $\frac{1}{7}$ the thickness of the lines which Dr. Curtis declares to be our limits allowed to us by him. Furthermore, we may trust that Dr. Heitzmann knows as well as Dr. Curtis when a lens is out of adjustment, as when it is in adjustment, and—not taking anything else into consideration—if of two observers, both we may suppose equally good, the one sees more than the other, and many others also see more than that one other person, there can be but little doubt for us in which line to decide. One good point seems to us to be brought out by Dr. Curtis in his last passage where he maintains that he has shown that some of the structures said to show the net-work were so altered by chemicals as to be useless for any such purposes. Microscopists are a trifle inclined to abuse their specimens with too strong chemicals like chromic acid, chloride of gold, nitrate of silver, etc. They show up something, but not quite the natural thing.

IN SYMPATHY.

The many friends of Dr. L. C. Taylor and wife, of Hartford, Ct., will be pained to learn that they have suffered the loss of an only son, a bright and manly little fellow of nearly seven years, who died February 25, of scarlet fever. Fathers and mothers who have had and lost only know how much of their own lives is involved in the going hence of one of these little ones.

If any of our new subscribers want Volume One of this Journal, or any part thereof, we can supply them to a limited extent.

We hear it whispered—perhaps by the winds—that a new work on Operative Dentistry is among the near possibilities, if not probabilities, by Dr. L. D. Shepard, of Boston, late Professor of Operative Dentistry in the Harvard Dental College. We have no hint of this kind from the Doctor himself, but have been informed that, in response to numerous importunities on the part of prominent members of the profession to make such use of a large amount of matter in his possession, he has the question under consideration, with at least some prospect of complying therewith.

There are few men better equipped for the preparation of a work on this branch of dentistry, and the reputation of Dr. S. as an operator would ensure its prompt popularity. A simple remark by one of the oldest men in the profession is to the point: "If Dr. Shepard writes a work on Operative Dentistry, it will be a good one." That there is a call for a text-book on Operative Dentistry that shall be "up to the times" and of some practical importance to the general operator, there can be little doubt, and it is to be hoped that the right man will soon undertake to meet this deficiency.

Under "Societies" may be found a notice of a joint meeting of the Massachusetts and the Connecticut Valley Dental Societies, to be held in Springfield, Mass., June next. Measures are in progress which cannot fail of making this one of the most important meetings that have ever been held. Particulars will be given at an early date. In the meantime, let the "appointment books" of every New England dentist, at least, be arranged with the dates of this meeting in view.

Dr. Thomas Fillebrown, of Portland, Me., has been appointed Professor of Operative Dentistry in the Harvard Dental College, to fill the vacancy caused by the resignation of Dr. L. D. Shepard some months since. Prof. Fillebrown has for several years been one of the most active and progressive men in the profession, a leading man in several local societies, one of the prominent workers and officers of the American Dental Association, and at present the President of the New England Dental Society. Universally esteemed by the profession, a fluent speaker, possessing good judgment and marked abilities as an operator. In short, an excellent appointment.

Probably all dentists have noticed the fine teeth of Jews in general, but have they noticed that the teeth of Jews are exactly in accordance with those of the population in which they live? In Russia they are excellent, and woe to the dentist who would try to get a paying practice in a Russian village of only 20,000 inhabitants. In Germany they are of middling quality, while in Switzerland they are as bad as those of the rest of the population. The Jew of the Orient has beautiful yellowish teeth, small, with long roots.

Probably the worst teeth are in the possession of the Swiss of those living in what is termed the German cantons. Switzerland is about seven-tenths German, one-tenth Italian, and two-tenths French, and along the borders of the lake of Zurich and Constance, we can almost challenge any one to find a mouth with more than half of its teeth. What is the cause? The mixing of races—Celts, Goths, Alemans and Germans; or the food, or drink, or habits of uncleanliness?

J. K. Knight, D.D.S., of Cambridge, Mass., was chosen valedictorian by the graduating class of the Boston Dental College, and delivered an interesting address at the closing exercises of the college there, on March 7th.

A valuable dental practice is offered for sale in our advertising pages.

Operating Table and Laboratory.

A REFLECTOR FOR ILLUMINATING THE MOUTH.

Something has been said recently about a new application of electricity in dental surgery. A small electric lamp is inserted in the mouth and lights up the caverns of decayed teeth. In this connection it may be stated that a reflector for illuminating the mouth, which answers the same purpose and much more simply and satisfactorily, has been devised. It consists simply of a glass bulb, or globe fixed to a standard, and which is filled with distilled water and a solution of sulphate of copper. Behind the globe is an adjustable reflector, between which and the globe is a gas jet. The simple adjustment of the reflector behind the gas jet throws the light in the desired direction. Turned into the mouth and again reflected by the dentist's small glass, the very strong rays of light reveal the minutest defects. Its convenience as compared with that of an electrical apparatus thrust into the mouth, to say nothing of the absence of annoyance to the patient, can be appreciated. The reflector spoken of is manufactured in London, and two only are said to be in use in this country, one of which is in the office of a Chicago dentist.—*The Sanitary News.*

TO REPAIR SLIPPING DISKS.

Users of the sand-paper or other disks, mounted on the ordinary screw mandrel, are doubtless troubled at times to prevent their slipping. The slipping is a result either of the wear or careless make of the mandrel, the center of the screw head coming to a bearing first instead of the periphery. To remedy, take a sharp chisel and, while the mandrel is revolving—without the screw head—pare down the center so that the end will be somewhat dishing. See that the screw will turn *quite in* and freely, without the disk, and there will be no further trouble, at least, till the operation needs repeating.

PROFESSIONAL ETHICS.

We had thought of writing a few lines on the above subject, but perhaps it is not best. The whole subject may be summed up in a few words. Any man who has a reasonable degree of self-respect will never *need* such laws to prevent either self or professional disgrace. Without self-respect, it is impossible to foretell what any person may be guilty of doing. We doubt the possibility of restraining such a one by means of a *code.*

SULPHURIC ACID IN AMALGAMS.

If filings of metals remain exposed to the air for any length of time an amalgamization takes place much slower. As mercury is an easily oxidized element, it is necessary to keep it from contact with the air as much as possible if it is desirable that after hardening a uniform texture should be obtained, and that the density of the filing should correspond with the metal filings. If a drop or less of sulphuric acid be added while rubbing the mercury and filings together, union is accomplished easier, as the oxide unites with the acid; and if the amalgam is afterwards washed in water, every part of the acid is removed, and a good filing material obtained.—*Zahntechnische Reform.*

Editors New England Journal:

The particulars of a case, to *me* remarkable, I send you to use as you see fit:

Last July I extracted all, as I supposed, of the remaining teeth and roots, some six or seven, from the upper jaw of Mrs. N——, aged sixty-eight. November following, the mouth apparently in proper condition, I inserted a full upper denture, which was worn with satisfaction until about Christmas time, when a swelling came in the roof of the mouth, which subsided on the appearance of a hard substance at the bottom of a shallow sinas at the location of the right superior canine. On attempting to remove the supposed *root*, an unusually long, sound canine was extracted, with much difficulty, only imperfect in the point of the cusp being absent, not decayed, but apparently undeveloped from pressure upon the apex of an adjoining tooth. No knowledge of its previous absence could be recalled.

Yours sincerely,

J. W. KEYES.

COLORED COLLODION.

Colored collodion is one of the most convenient articles for laboratory use that I know of. Coat your impressions with it, and the ease with which you may separate it from the model will greatly please you. It never freezes and is always ready, provided you keep on hand a bottle of ether to thin it with. To prepare colored collodian, dissolve a quantity of red aniline in alcohol, and from this use enough to color the collodian, which you can procure from any drug store.

J. G. H.

BIBLIOGRAPHICAL.

MRS. PABKE'S ONE HUNDRED RECIPES FOR DISHES BOTH WHOLESOME AND PALATABLE. Springfield, Mass. M. C. Stebbins & Co.

"These recipes discard the use of baking-powders, saleratus and soda." Perhaps few people know the difference of the action of yeast and of baking-powders. It is true, both substances raise the bread by evolving carbonic acid, but beyond that, the resemblance ceases. The yeast plant produces the carbonic acid from constituents of the flour, thereby changing the latter itself, transforming a large part into dextrine and butyric, etc., acids, which are much easier digestible than flour itself, while the soda does not prepare the flour for digestion, and throws the whole work on the system. Mrs. Pabke, who herself is a cook of great skill, has picked out many national dishes from the rich national agglomeration, called Austria, and we doubt if there is not a great number among them that will prove a real blessing to dyspeptic martyrs of the mashed-potato, soda-tea-cake and white soda-bread. But the dish, called "paprika" (on page 21), would seem to us rather strong, using "a pint of red pepper" for a few chickens. As we are informed by best authority, it ought to read, "a pinch of red pepper." This is the only error of consequence in the book. For originality and ingenuity of some of the dishes, the book will be held in high esteem by people of slightly epicurian fancies, and for dyspeptic ones we would recommend meals after these recipes. The price is very low, only 25 cts. It is neatly printed, free from any advertising dodge; not a single patent-article is recommended or mentioned in the book.

ADDRESS DELIVERED BEFORE THE AMERICAN ACADEMY OF DENTAL SCIENCE, AT THEIR FIFTEENTH ANNUAL MEETING. Boston, Oct. 25, 1882. By Frank Abbot, M. D.

An oratorical effort of rare merits. He reviews the history of dentistry and shows that also in this branch the mediæval night extinguished all the progress of the Greeks and Romans for over a thousand years. The only ones fit to survive in those times were warriors, monks and "muckers;" even the free-minded emperor, Frederick II. (between 1220–1255), could do but little in that intellectual night. Dr. Abbot has the sympathy of all men, wishing the best of the profession, if he urges "more light" and education; and only from this stand-point can we agree with his favorite idea that every dentist ought to graduate as an M. D.

ELECTRISCHE VORGÄNGE IM MUNDE (ELECTRICAL PROCESSES IN THE MOUTH). By Dr. Willoughby Miller. Berlin, Gy.

This is a careful little essay, appearing in pamphlet form. It embodies valuable experiments about the conductive power for electricity, of dry and moist dentine. We have given the results in our last number.

MINUTE ANATOMY OF THE TEETH, by Dr. Carl Heitzmann, and MINUTE ANATOMY, ETC., OF THE DENTAL PULP, by Dr. C. F. W. Bodecker. Reprint from the Dental Cosmos.

A paper read before the New York Odontological Society, February 1882. The first paper is by the master himself, and we have simply to read and to accept. The second paper of one of his ablest co-workers, and perhaps the best specialist in dental microscopy, is really admirable. The fine cuts alone, showing immense improvements over the childish cuts of only ten to fifteen years ago, are worth "millions" to an investigating dentist. How small a thing is a tooth, and how immense is the science of such a little block! It has been said that about every word in the Bible a book has been written, and we think humanity has done very much, but millions of books will still be written and will have to be known till science shows signs of exhaustion. Will a dentist who claims to be abreast with his fellow workers in his own department, dare to do so without studying those fine specimens of clear and sharp observation?

UNTERSUCHUNGEN ÜBER DAS WESEN DER ZAHNVERDERBNISS (Investigations about the Nature of Dental Caries), by M. SCHLENKER, of St. Gallen.

A voluminous treatise of 160 pages, which we will consider more fully in our next number. We are indebted to Dr. Schlenker for an excellent history of the views about caries, which we print in this number.

TAFT'S OPERATIVE DENTISTRY. Fourth Edition. Revised, with one hundred and thirty-six illustrations. Philadelphia. P. Blakiston, Son & Co. Price, cloth, $4.25; sheep, $5.00. A book of 509 pages.

The first edition of this work was published in 1861. Since that time it has been a text-book in many of our dental colleges. The author says: "It has been in many instances a somewhat difficult task to decide as to the rejection of some methods, instruments and appliances. It is not always easy to determine upon the merits of the new as compared with the old and tried. Caution and perhaps wis-

dom dictates that those things that have been thoroughly tested and approved should not be hastily thrown aside for those of recent production, without good evidence of improvement." "Quite a number of instruments and appliances have been dropped from the work, and only those retained that are valuable and efficient." In the appendix, one section is devoted to Watt's Chemical Theory of Dental Caries; one to Dr. Corydon Palmer's Plugging Instruments; one to Mallets, and one to Dr. Louis Jack's Matrices for Proximal Fillings.

That a fourth edition of this work is demanded, is evidence that teachers in dental colleges deem it better for the use of students than any work yet published.

SOCIETIES.

The Massachusetts Dental Society and the Connecticut Valley Dental Society hold a three days joint convention at Springfield, Mass., June 6, 7 and 8. In our May number we will give full particulars. It is proposed to make this meeting one of the best that has ever been held in New England.

The Alabama State Dental Society meets in Montgomery on the second Tuesday in April.

The Georgia Dental Society will meet in Atlanta the second Tuesday in May.

The Kentucky Dental Association holds its next session on the first Tuesday in June, at Louisville.

Members of the profession who purpose appearing before the Board of Censors for examination for the diploma of this society and the degree of "M.D. S.," should immediately communicate their intention to Dr. Frank French, Secretary of the Board, at Rochester, and report to him personally the morning of May 8th, 1883, at the Delavan House, Albany. The examinations will begin at 10 A. M., and continue throughout the day, or until the list is exhausted. No examinations will be held during the session of the society.

J. Edw. Line, Secretary.

The St. Louis Dental Society meets first Tuesday in each month, excepting August and September, at 204 North 5th Street, St. Louis, Mo.

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ORIGINAL COMMUNICATIONS.

THE TREATMENT OF PYORRHŒA ALVELORIS, OR INFECTIOUS ALVEOLITIS.

BY ADOLPH WITZEL, ESSEN, GERMANY.

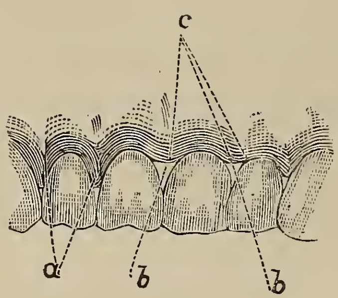
[A paper read before the Annual Meeting of the Dental Association of Germany, at Heidelberg, August 1, 1881,and published in the Vierteljahrsschrift fur Zahnhielkunde.]

Gentlemen: The subject of my paper is a disease of the dental sockets, which it has been customary to name alveolar blennorrhœa. Hitherto so little has been positively known of the essential character of this peculiar affection, that it will surprise no one that we are in the dark both as to its causes and its treatment.

If we follow, step by step, the clinical phenomena of the disease, which, so far, I have only observed in well-developed jaws with sound teeth, we notice the following essential appearances: At some spot in the row of permanent teeth, one of the processes of gum, which is normally found as firm tissue filling up the space between the necks of the teeth, is seen to be somewhat retracted and everted, as it were. If the affection, which is a serious one, whatever variety of tooth it attacks, begins between two incisors, we find, on examina-

tion of the mouth, an appearance somewhat like that depicted in Fig. 1.

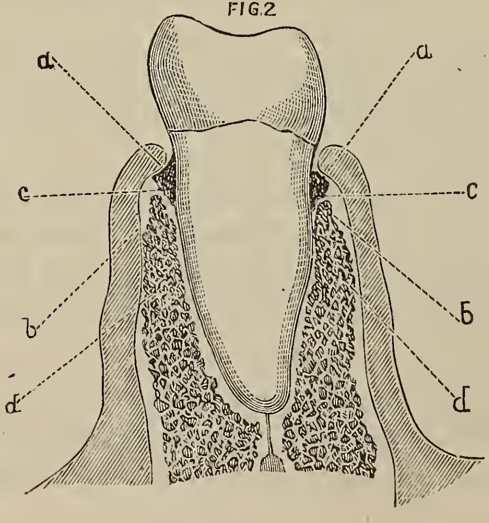
Fig. 1.



The space between the central and lateral incisor is filled by a healthy process of gum tissue, *a;* at *b*, on the other hand, we see the first sign of commencing alveolitis, namely, disappearance of the process of gum, and in consequence a free space between the necks of the teeth. This disappearance of the process of gum between the teeth is the first pathognomonic symptom of the disease under discussion.

The gum itself at first presents no inflammatory swelling; its color is normal, and all that we find is a looseness of the ring of gum which normally surrounds the neck of the tooth like a sphincter. If, now, we pass a fine excavator under the everted margin of gum, we find, with few exceptions, on the approximal surfaces of the necks of the teeth at *c. c.*, Fig, 1, small acuminate deposits of concretion of a greenish-black color, by which the adjacent margin of gum has been thrown into a state of chronic inflammation. Later on we find the gum somewhat lifted up from the neck of the tooth by these deposits, so as to form a sort *of pocket, from which a dirty purulent secretion exudes on pressure* (Pyorrhœa). On probing this pocket, we find the border of alveolus between the necks of the teeth, rough and denuded of periosteum, and from an examination of jaws which have been macerated, it is evident that even at this early stage of alveolitis, the affected alveolar border has already lost its covering lamella, and has become quite porous.

FIG.2



In Fig. 2 I have shown these appearances diagrammatically. At *a a* we see the rough concretions on the neck of the tooth, which have been deposited close to the alveolar border, and have separated the gum from the neck of the tooth. In the pocket thus formed (*c c*) the products of decomposition collect, the periosteum of the alveolar border is destroyed, and the edges of the latter (*b b*) undergo necrosis.

It is further to be observed, that the sub-mucous connection between the gum and the periosteum of the alveolus is also, as a rule, destroyed as far as *d d*, so that the socket becomes necrosed on both sides at once.

At the very commencement of the disease, the teeth belonging to the sockets affected by it, appear *somewhat loosened;* and the further the process advances, the looser they become, until they are at length completely extruded by the granulation tissue which grows from the enlarged cancelli of the diseased portions of bone.

During this process, which mostly runs a chronic course, the *periosteum of the root of the tooth* becomes disintegrated from the neck of the tooth to its very apex; but, like the gum itself, it takes but little part in the formation of pus, usually so copiously poured out in this disease. The *source* of the *pus* is rather to be looked for in the medullary substance of the ring of bone surrounding the neck of the tooth; for if the alveolus be examined at the moment of extraction, and before it has become filled with blood, the diseased portion of bone will be seen covered with pus and soft granulations. I have frequently found this soft connective-tissue, neoplasm, very abundantly developed on the inter-alveolar walls of the upper and lower molars, where it occurs in the form of lobules on the more or less disintegrated portions of alveolus separating the fangs. It is also sometimes found after extraction, on the tooth, between its roots.

. . . .

It is not until the process has penetrated to the bottom of the alveolus, and the tooth is quite loose, that we find this granulation tissue also occupying the base of the socket. In this case, the growth of granulations from the medullary tissue at the root of the tooth leads to a breaking down of the cementum—as the result of which, the apex of the tooth is seen to be quite rough. I have not yet observed the total disintegration of the layer of cementum which Magitot has described as characteristic of the disease. As a rule, the patients will not allow you to extract the affected teeth until they have become quite loose; but if you should ever chance to extract a tooth at the early stage of the disease, you will find the soft disorganization of the dental periosteum confined to the neck of the tooth. The remaining portions of it are velvet-like and loosened, and present a brilliant vascular injection, increasing towards the root, and associated with small nodules and lobular granulations. I have not yet examined these growths for nests of micrococci, but I have no doubt that they are to

be found, not only in the granulations, but also in the infected, medullary tissue of the inter-alveolar partition. In the pus which may be obtained from the affected alveoli by pressing the gum we observe, under the microscope, a countless number of micrococci and bacteria, which doubtless find, in the pockets of gum tissue, *the most favorable conditions for their continuous development.* The pulp appears to me to be involved in this affection only secondarily. The earliest changes in it bear some resemblance to the net-like atrophy described by Wedl. At first, the larger vessels are seen to be congested, and there are deposits of lime salts in the pulp tissue. It is not until later, when the disorganization of the alveolus has reached the end of the fang, that the pulp of the *now entirely loosened tooth* breaks down into a fetid, fluid mass. In single cases, however, I have found pulps inflamed and gangrenous, even before the teeth had become fully loosened. This has chiefly occurred in the case of younger patients, in whom the disease ran an acute, and not a chronic course; the teeth became loose a few weeks after they were first attacked; they grew sensitive on mastication and to heat, and generally had to be extracted from the affected sockets after they had caused the patient several sleepless nights.*

I was very much struck, in some of these cases, with the fearful pains which the patients complained of, as well as with the phenomena with which the suffering was associated. I have repeatedly observed high fever, rigors, hard, phlegmonous swelling of the side of the face and sudden formation of abscess under the gum. When teeth are attacked in this way, their periosteum becomes in great part disintegrated and covered by a fetid ichor, which continues to pour itself out of the abscess after the extraction of the teeth, which, I may add, are usually free from caries.†

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*The above clinical observation led me, in a few cases of alveolitis, to try opening the pulp cavity, disinfecting it, and subsequently filling it antiseptically. The experiment was not invariably successful; still, a certain number of teeth treated in this way have, for years, lost all sensitiveness on mastication, and have not, apparently, become looser. In one case a lower molar, the pulp cavity of which I opened successfully five year ago, is still firm, while all the other teeth have been either extracted, or are more or less loose in their sockets. But we shall not be able to come to any conclusion as to whether this treatment is advisable or not, till more numerous experiments have been made in respect to the opening up and antiseptic filling of the roots. I consider that perforation of the pulp is not indicated in the case of a firmly-planted tooth until gangrene of the pulp is proved with certainty to exist.

†In the treatment of infectious alveolitis, certain precautions seem to me to be called for; for not only can the process be conveyed from alveolus to alveolus by infected instruments which have been used for the purpose of cleansing the pockets of gum tissue, but, as will be

The causes of this affection, the first symptoms of which are invariably overlooked by the patient, and were until lately little regarded by the dentist, are still more or less unknown. Neglect of the teeth encourages it, and also, more particularly, the deposits of concretion on the necks of the teeth, by means of which the gum is lifted up from them. The usual deposits of tartar, with which we are all familiar, are firmly attached to the neck of the tooth, upon the margin of the gum, which is gradually mechanically pressed down from the neck of the tooth towards the fang, by the gradual increase of the chalky concretion; the alveolus and its covering disappear, but simply from atrophy, through pressure. But in this process, which is one of very slow progress, the connection between the gum and the periosteum of the jaw and the alveoli remains unbroken; it is a localized process, as may be observed in those cases in which it so frequently occurs in conneetion with incrustations of tartar on the lower incisors.

The greenish-black concretions, on the other hand, always form on the neck of the tooth *beneath* the gum, close to the inter-alveolar wall, and, by their gradual growth, destroy the connection of the gum with the periosteum of the jaw and teeth.

I have hitherto been unable to find any definite point of contact between alveolitis and constitutional affections; it appears to me, however, that prolonged residence in damp dwellings favors its occurrence. Other causes are to be found in the various affections of the gum, which lead to a collection of irritating substances between the gum and neck of the teeth. Among the sailors of Heligoland, not one of whom has probably ever used a tooth-brush, almost two-thirds lose their teeth, at a very early age, from alveolar pyorrhœa, which, however, in this case, is always associated with spongy softening of the gum.

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seen from the following case, the putrefactive products of the alveoli are not without danger to the operator, if they come in contact with such slight wounds as the dentist is liable to have on his fingers. Some years ago M. Montegel, a dentist of Coire, treated a lady with acute alveolar pyorrhœa. In the course of examining and pressing the alveoli, he infected a small skin wound near the root of the nail of the index finger. Twenty-four hours later his hand swelled up considerably. On the third day, the lymphatics of his arm, as far as the armpit, were severely affected, and on the sixth day a deep-seated abscess appeared in the neighborhood of the wrist. The whole course which this affection of the hand ran, clearly proved infection of the wound by the alveolar secretion. M. Van Geldern has also recorded a similar case. One ought, therefore, before he examines a patient with alveolar pyorrhœa, to cleanse the margins of the gums, which are usually covered with matter, with an alcoholic solution of soap, and after the treatment to use the same to the instruments and ends of the fingers.

As a general rule, then, it may be accepted that any affection of the gum that arises from want of cleanliness, may in the end give rise to a considerable softening and loosening of the gum from the neck of the tooth, and so prove an indirect factor in the causation of alveolar pyorrhœa. Nevertheless, it is necessary to insist upon the different course run by simply affections of the gum, as compared with that of infectious alveolitis. Simply gingivitis and ulcerative stomatitis can both be easily and thoroughly cured, as soon as the necks of the teeth are cleansed of mucus and tartar, the ulcerous edges of gum cauterized with chloride of zinc or carbolic acid, and the teeth and gum carefully cleansed by the patient with a soft brush and carbolized spirit. In these cases, teeth often become considerably loosened, as we have sometimes seen in cases of ulcerative stomatitis, without being lost; but here, as in the case of all affections of the gum, the loosening is invariably a secondary result, and as soon as the gum grows healthy, the teeth again become fast in their sockets.

Now, if the disease we are discussing were a simple blennorrhœa of the gum, it could, like other gingival affections, be easily cured without loss of the teeth. This, however, as I have learnt from my own experience, is not the case, and on this ground it is necessary to draw a distinction between the disease of the alveoli, which is the subject of this paper and diseases of the gum, though I am free to admit that neglect to cleanse the gum often enough gives rise to the former affection. *We have, in fact, to deal neither with an ulceration of the gum, nor with a primary inflammation of the dental periosteum, but with a molecular necrosis of the alveoli, or caries of the dental sockets, produced by septic irritation of the medulla of the bone.*

The affection is not to be confounded with senile atrophy of the alveoli. On the contrary, it occurs most frequently in strong and healthy persons in middle life, and, according to my observations, seldom, I might say almost never, attacks carious teeth with diseased pulps. Senile atrophy consists in a steady disappearance of the socket, by means of which the fangs of the teeth are gradually laid bare; there is no necrosis of the alveolar margin, and the gum remains firmly attached to the latter and to the periosteum of the jaw. In alveolar pyorrhœa, on the other hand, there is, as already mentioned, a loosening of the gum from the outer border of the alveolus, by means of which the periosteum of the latter becomes exposed and destroyed by colonies of micrococci, while the margin of the bone, thus robbed of its covering, is infected, and finally becomes softened by caries.

Alveolitis is a disease which—exactly as we might expect from the cause that gives rise to it—attacks first, by preference, the *strong inter-alveolar partition*, and it is a distinct error of observation to maintain that it chiefly affects the labial lamella of the alveoli, or that it is more frequently found in connection with teeth with a single fang than with the molars or bicuspids. I have often seen the affection occurring in young persons, between the ages of twenty-five and thirty years, where senile atrophy of the alveolar process was certainly quite out of the question, and I have seen it attacking the most different kinds of teeth. I have observed its commencement, both on the upper and lower wisdom teeth, and also on the bicuspids and incisors; but it invariably happened that the starting-point of the disease was in *one* inter-alveolar partition.

An affection resembling alveolar pyorrhœa is observed in the eruption of the lower wisdom teeth, if they happen to be dislocated backwards, and remain beneath the gum for a prolonged period.

In this case, also, putrefactive products collect between the neck of the tooth and the gum covering it; and the mechanical injury to which the swollen mucous fold at the angle of the jaw is exposed, together with the septic irritant which is conducted from the pocket of the gum to the alveolar border, lead to those violent inflammations of the angle of the jaw which we know so well in practice. The cause of this inflammation is thus similar to that which produces alveolar pyorrhœa, but the course of the two affections is utterly different. If the wisdom tooth is extracted before it has led to extensive inflammation of the jaw-bone, the affected alveolus heals up, and the loosened neighboring tooth, the socket of which has been more or less involved in the inflammation and undergone some degree of softening, again becomes fast; and that even though the inflammation has run a chronic course, and the misplaced tooth is not removed for years.

In these cases, if we examine the enlarged alveolus and the periosteum of the root of the wisdom tooth, we find almost the identical changes which are observed in teeth with commencing alveolar pyorrhœa; and yet the inflammatory process that occurs in the case of eruption of a wisdom tooth remains confined to the one alveolus, and the adjacent tooth continues firm, while infectious alveolitis speedily attacks the contiguous alveoli, and causes the loss of the teeth they contain.

I have dwelt on this comparison with the view of showing that in

alveolar pyorrhœa there is a certain something co-operating—either a predisposition on the part of the alveoli, or, as to me appears more probable, a virus, of the nature of which we are as yet ignorant. It is true that I have not hitherto made any attempts to convey the affection from one individual to another, by transferring the pus from a diseased alveolus to a healthy one. The fact, however, that it usually begins in the neighborhood of one tooth, and never attacks a whole row of teeth at once, and that its extension is best prevented either by treating the diseased alveolus antiseptically, as soon as possible, or by extracting the tooth, proves that we have to deal with a local contagion.

Before I pass on to describe my treatment of this affection, I must beg of you not to infer that my method is a perfect one, or one that is reliable in every case. It is, indeed, the custom to regard infectious alveolitis as incurable—a view which finds its justification in the fact that the patients do not, as a rule, seek our aid until their teeth have become very loose, and have been rendered painful by the pressure of mastication. After what I have already said, I need go into no further explanation of the reasons why such teeth can never be saved by conservative treatment. It is true that, by suitable treatment, such as cleansing and disinfecting the pocket of gum, we can procure alleviation, but we can never obtain a permanent cure, and make the teeth again firm in their sockets, if the latter have been destroyed to the extent of more than a half.

In general, my opinion is that the treatment of the affection should be directed less to the preservation of teeth which are already loose, than to using every possible precaution to prevent the putrefactive secretion of the affected alveoli from infecting those that are still healthy.

If we are to strive to cure the affection, the first and most important step to be taken is to remove every tooth which is much loosened at the very commencement of the treatment. For all attempts to preserve a loosened tooth, the socket of which has been destroyed by the carious process to the extent of more than one-half, will prove useless. It is of special importance, in the case of younger subjects, not to delay, any longer than possible, the extraction of bicuspids and molars which have been attacked by alveolar pyorrhœa; for the later such patients submit to extraction, the smaller their chance of preserving the dental organs. We ought, therefore, to examine how far the alveolus still surrounds the neck of the tooth. In the incisors it

is, as a rule, the labial and mesial portion of the socket which is first destroyed, and it is astonishing how far we sometimes have to pass the sound, between the gum and the tooth, before we feel the rough border of the alveolus. In the case of upper and lower molars, if the sound penetrates between the forked union of their roots, there is little prospect of saving them; for it is precisely the stoutest alveolar partition which, as consisting almost exclusively of cancellous tissue, and being therefore most richly provided with medullary tissue, become most rapidly disintegrated by the inflammatory process.

In a lady of about thirty-five years of age, alveolar pyorrhœa began in the wisdom teeth of both jaws. In spite of my representation, the patient could not make up her mind to have the teeth at once removed, but kept them in their diseased sockets until the pain experienced in mastication at length compelled her to have them extracted. In the meantime, however, the sockets of the second molars had also become more or less infected, so that soon one of these, too, had to be removed. After this experience, the patient consented to an early extraction of the three second molars still remaining, the sockets of which had already become somewhat expanded, but which had not themselves as yet grown either loose or painful. The result of this operation was that the process was arrested in the alveoli of both jaws, and the first molars, which would otherwise to a certainty have fallen a prey to the affection, still remain sound, after a lapse of four years. The teeth adjacent to the affected ones will naturally be more or less loose, but as every extraction is followed by cicatrization of the alveolus and thickening of the surrounding bone, this operation must necessarily have the effect of again, more or less firmly, securing the adjacent tooth. If now, according to my view, the alveoli of the teeth, which are only moderately loosened, are treated antiseptically, we are entitled to expect a cure of the evil so soon as ever the faulty neighbor has been removed.*

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*The question whether it is advisable in older patients affected by alveola pyorrhœa to remove teeth the sockets of which are partially affected, I am led by my experience to answer in the affirmative; for such loose teeth are only of very doubtful use to their possessor, and at the same time they prevent him from properly masticating with the teeth which are still sound. It is true that in the case of the incisors we ought, for æsthetic reasons, to delay extraction as long as possible, and to attempt to heal the alveoli; but if we do not quickly succeed, we ought, even in this case, to extract without delay, and after removal of the useless teeth to make a partial denture, in order that the patient may become used to the wearing of artificial teeth before he has lost all his natural ones. The teeth which still remain unaffected by alveolar pyorrhœa render this easy for him, and if in time these weak supports are lost—a common event in older subjects—the patients will have already become accustomed to a plate, and will more easily get over the discomfort of a complete set, resting, as it will do, on a jaw the alveolar process of which has entirely disappeared.

When, after careful examination of all the teeth, I have extracted those the sockets of which have been more than half destroyed, I proceed to cleanse the remainder from all concretions situated below the gum. The most thorough cleansing of all the necks of the teeth is necessary as a preliminary, if the subsequent antiseptic treatment of the alveoli is to be successful.

For the disinfection of the diseased alveoli, as well as for the general treatment of the affection, I regard a small glass syringe with fine gold canules as indispensable. For it is only by using such an instrument that we can bring the solution of carbolic acid and chloride of zinc, which I recommend in this treatment, into immediate contact with the pockets of gum and the diseased portion of the alveoli.

. . . .

The syringe comes into play in the treatment of alveola pyorrhœa as soon as ever the necks of the teeth have been thoroughly freed from mucus and deposits of concretion, and it is used in the following manner: First, one lays a piece of blotting-paper (an excellent preparation is Parker's paper-fiber lint) on both sides of the alveolar border, in order to absorb the caustic solution as it flows out of the pocket of gum. Then having filled the syringe with the disinfectant, you introduce the canula, as far as possible, between the gum and the tooth up to the border of the diseased alveolus. If you are using Farrar's drop syringe, you next give one or two turns of the screw, at the same time carrying the point of the canula somewhat around the neck of the tooth. By this means, the whole of the pocket of gum and the diseased alveolus are thoroughly bathed in the caustic fluid.

For disinfecting pockets of gum, in connection with the incisors and bicuspids, and, as a general rule, in the case of all teeth in the upper jaw, I employ, as far as possible, the straight canula, reserving the curved canula for the teeth of the lower jaw. In all cases, the point of the canula is to be well introduced at both the mesial and distal side of the neck of the tooth, in order to disinfect the inter-alveolar pariotes which form the seat of the disease.

This mode of applying caustics is not, as a rule, painful to the patient. The only necessary precaution is to see that the portions of solutions that flow out from the pocket of gum do not escape into the mouth, but are taken up by the blotting-paper. In cases of alveolar pyorrhœa, associated with pain, two drops of tincture of iodine and aconite may be injected into the recess in the gum before the application of the escharotic—a much more effectual way of applying the tincture than simply painting it on the gum.

It will be the surgeon's duty, whenever possible, to carry out this disinfecting process three times in the first week. But even this rational treatment will remain without result if he cannot persuade his patients to promote the cure by cleaning the teeth and gums by means of a soft brush, tooth-powder, and carbolized spirit. And even here the result will not depend upon the agents, whose composition I give below,* so much as on the way in which they are applied. We have all in times past used iodine, carbolic acid, chloride of zinc, nitrate of silver, &c., in the treatment of alveolar pyorrhœa, without any very great results. This fact is easily explained, for hitherto, in our use of these applications, we have never been able to bring the medicament to act directly on the seat of the disease. When we have attempted to convey nitrate of silver in powder, or any other substance into the alveoli by means of a piece of wood, it has usually happened that the agent has been rubbed off the wood by the margin of the gum, with the result that the action of the escharotic has been confined to the latter, while the contagion has been quietly left to continue its work in the alveolus. The result is quite different when we make use of this syringe which, I may add has, in my hands, also proved extremely valuable in the antiseptic treatment of the root canals—for the application of the antiseptic to the alveolus, for which we intend it. This method of treatment, although I recommend in it the employment of well-known agents, is so different from our old system, that the two cannot be compared for a moment, and I think that my experience up to the present time entitles me to express the hope that by the use of the alveolar drop-syringe, we shall quite certainly be able to contend against alveolar pyorrhœa with more success than hitherto.

In conclusion, I will show you, first, the model of a jaw, from which, after fruitless treatment of the disease in question by means of the old method without the syringe, I had to extract the teeth that are miss-

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* ℞ Acid, Carbolic, 5.0 ;
Spir. Vini Rectif., 400.0 ;
Aq. Menthæ Pip. 100.0 ;
Ol. Anisi 1,0, Ol. Cinnamon, acut., 0.5 ;

M.—For brushing the gum in alveolar pyorrhœa.

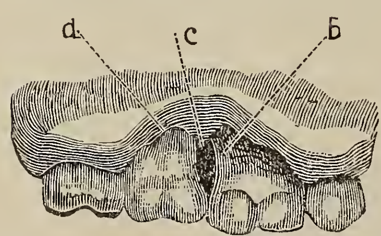
℞ Potassii Iodidi, 5.0 ;
Acid, Carbolic, Zinci Chlorid., Alcoh. Absolut., a a, 25.0 ;
Acid, Hydrochl., 2.0 ;
Aq. Destill., 10.0 ;
Ol. Menthæ Pip., 5.0.

Misce et filtra. For syringing out the pockets of gum in alveolar pyorrhœa.

ing, though quite sound. The patient, who was at the time a man of not more than forty years old, with strong teeth, now wears an artificial denture. In the case from which the other impressions were taken, the jaw and teeth alike were strong and healthy. About a year ago, commencing alveolitis appeared at the first upper molar on both sides, and at the second lower molar on the left side. These three teeth, which had already become very loose, were extracted, and the alveoli of the neighboring teeth, which were less involved in the septic process, were repeatedly injected with the solution of iodine, phenol, and zinc chloride, alternately with simple tincture of iodine, which we know to be a very powerful antiseptic. The patient, who had previously somewhat neglected his dental toilet, now thoroughly brushes his teeth and gums, several times a day, with a soft brush and carbolized spirit. He comes to me every eight weeks, to have the alveoli, previously involved in the disease, injected, and we are both rejoiced to see the continued healthiness of his other teeth.

In another case, a man aged twenty-four, the disease ran a very peculiar course. At the age of twenty-two, the lower central incisor, which was somewhat prominent, and the left first lower molar were attacked by the disease, and shortly after extracted, the alveoli of the adjacent teeth remaining healthy. Two years later, the affection showed itself in the alveoli of the upper jaw, and the patient himself removed the right first bicuspid, which had become very loose. Suppuration from the alveoli of the left bicuspid induced him to again seek professional aid.* On examination, it was found that the alveoli of the bicuspid, and first molar on the left side were entirely disintegrated, as also that of the first right molar. Here the process had completely destroyed the septum (Fig. 9) between the first and second molar, and had partially destroyed the facial lamella of each tooth (a b). Fig. 9 shows this portion of the alveolar process; it represents an appearance which may be looked upon as characteristic, as regards the extension of alveolitis in the upper molars.

Fig. 9.



The prognosis in this case was an

*The young man is now quite cured. He says that at the age of eighteen he contracted syphilis, but there is no other evidence to confirm the statement. In another man, aged thirty-six, alveolar pyorrhœa made its appearance in a similar manner, in the first molars of the upper jaw, four years after recovery from syphilis. The teeth were at once extracted and the evil removed, for the alveoli of the remaining teeth are now, after a lapse of two years, quite healthy.

unfavorable one, for not only were the alveoli of the teeth figured above either partially or entirely destroyed, but there was a copious flow of pus on pressing the gum over the canines, though these teeth were still firm. The alveoli of the lower jaw were healthy, the only sign of disease consisting in an eversion of the papilla of gum between the first and second molars on the right side. In this case, there were no concretions on the necks of the teeth, but the roots of the loosened teeth were thickly set with small nodules of deposit of the size of a millet seed.

In the treatment of this case, the first step was to extract the teeth which occupied the necrosed alveoli of the upper jaw, in order to put a stop, once for all, to the injurious discharge of pus; the next thing was to protect the remaining teeth, as far as possible, and to make them once more capable of use. After extraction, I found on the septa, between the alveoli, lobular granulations, which I removed as thoroughly as possible with a sharp gouge (Loffel); and I next proceeded to excise, with the same instrument, the necrosed remains of the alveoli on their facial aspect.

The canines were still firm, though their alveoli were diseased, and an attempt was made to treat them conservatively. The treatment consisted in syringing out the alveoli with a solution of chloride of zinc and phenol, and in scraping the carious alveolar border with a sharp excavator.

This scraping away of the soft alveolar border seems to me worthy of recommendation, in cases where we wish to try and save such teeth. The procedure, however, is only advisable in the case of teeth with single fangs, especially the canines, which, from the length of their roots, can afford to lose a considerable portion of their sockets.

There is one point which I must not omit. In the discussion which followed my paper at the Heidelberg meeting, among other suggestions it was proposed to cleanse the recess of gum by means of a stout camel's-hair brush. I tried this procedure on this patient. I found, however, that it was exceedingly difficult, nay, it was almost impossible, to introduce the brush between the gum and the neck of the teeth. At length I certainly did succeed in removing fairly completely the pus from the pocket of gum and in applying the antiseptic between the gum and the neck of the tooth. But this rather complicated procedure did not appear to me to furnish any satisfactory result. On the other hand, when the caustic was introduced deep into the pocket of gum by means of the syringe, the effect was most

striking. While pus could be obtained on pressing over the left canine, as much after brushing it out as before, on the other side, two injections sufficed to arrest the suppuration. Whoever, therefore, wishes to treat alveolar pyorrhœa in suitable cases, let him make use of a fine syringe and repeatedly cleanse and disinfect the pockets of gum with it. The patient cannot, I have become convinced, himself apply the injection.

The treatment of this patient is not completed. I believe, however, that I shall succeed in curing the alveoli of the canines. It is questionable whether the second molars, the internal buccal fangs of which are partially laid bare, can be preserved; the isolated bicuspids, the alveolar margins of which I have also superficially scraped, will again become firmer on the cicatrization of the adjacent alveoli, so it will perhaps be possible to retain them. My more recent experience teaches me to regard this affection as curable in many cases—especially in younger subjects—if practitioners will only give up useless attempts to preserve in their infected and necrosed sockets teeth which are already loose.

The more assiduously the patient assists us by brushing his teeth, two or three times a day, with a soft brush and carbolized spirit, the more favorable will be the results of our treatment. You must, therefore, impress upon the patient, as soon as he comes into your hands, that your efforts will be without avail, if he does not persevere in cleaning his teeth in the manner described, and come to you for the six weeks, two or three times a week, to have his alveoli disinfected.

Gentlemen: I now come to the conclusion of my paper, but I do not regard the subject as in any way completed or exhausted. Perhaps, however, we shall more easily succeed when our researches are all directed in the path I have indicated, in determining the nature of a disease which ever confines its destructive influence to the soundest teeth. *The most important part of this treatment falls under the head of prophylaxis*, for, according to my view, which is also shared by Riggs and others, it is deficient care of the teeth and gums that is the chief cause of this local lesion which, once present, endangers every one of the teeth. The dental surgeon must bear that in mind, and in the case of younger patients, who present deposits of concretion under the gums, must make every effort to carefully remove them, twice a year, and to persuade the patients to undertake that rational care of the teeth and gums which is so frequently neglected. People are in the habit of recommending and using the

hardest brushes and strong tooth powders to scour the teeth, but they, at the same time, carefully avoid the merest touching of the gums. The use of hard tooth brushes, however, is a bad habit, against which we cannot inveigh too strongly, and it is the duty of every dentist to warn his patients that a simple tooth powder of chalk and a little soap is the best to use, but that brushing the margin of the gum twice a day with a soft brush and spirit is absolutely necessary; for it is only by the use of spirit, that the mucus which collects on the borders of the gums and between the necks of the teeth can be removed. It is not enough to pour twenty or thirty drops of the solution into a glass of water and rinse the mouth, or brush the gums with it. The best way is to half fill a small glass with the solution, and to dip the brush into it several times at each cleaning.

Possibly you may look upon this last observation as superfluous. I am of the opinion, however, that the care of the gum is still very frequently left altogether out of consideration by many otherwise capable dentists. They will mallet gold into the very smallest fissures in molars, the sockets of which are already showing traces of alveolar pyorrhœa, in order to prevent the extension of caries in teeth which would last just as long without such fillings; but they deny their patients the most important service, because they neglect to clean the teeth and treat the pockets of gum. And yet the dentist can preserve more sets of teeth by carefully cleansing them, and by rational advice as to the treatment of the gums, than by any other operation.

Attention to the gums must be more strongly insisted on; without it we can expect no success whatever in our treatment of the disease under consideration. The advantage, however, which patients derive from carefully cleansing their teeth of concretions of tartar, is, as is generally believed, far greater; and the more the dentist directs his efforts in this sense, the more good will he do.

In conclusion, gentlemen, it is not in the preservation of useless teeth and the filling of decaying stumps that the secret of conservative dentistry is to be sought, but in the removal of all diseased teeth which are not absolutely necessary for good articulation, and in rational attention to the gums.

EDITORIAL.

Again the Legislature of Massachusetts has rejected a Bill regulating the practice of dentistry within its borders. The passage of a very mild Bill was secured in the Senate, but the House refused to concur on its final stage through that body. Thus, for another year, at least, Massachusetts must remain a sewer for dental incompetents, into which, by the wiser action of some twenty other States, they are directed.

Very strange laws about dentistry seem to be rampant in Vienna, Austria. By such a law, dentists are allowed to make artificial dentures and teeth, but are not allowed to take impressions or to prepare the mouth. The law also forbids a dentist to call himself doctor; they have to take to all kinds of devices to make the public believe that they are a doctor. One of the most ingenious ones is the following:

A dentist edited a small sheet called the Dental Doctor. He made a big sign on his door, reading, "JOHN SMITH, Editor of the DENTAL DOCTOR." Everything was printed in small type except John Smith and Dental Doctor, and the unwily public was taken in; but the authorities do not encourage enterprise, and so the doctor had to pull down his shingle.

ABOUT HYDROGEN PEROXIDE.

Dr. Herman Krätzen, in Leipsic, gives the following information about this powerful chemical. The H_2O_2 has taken place on the toilet table beside sozodont and thymol mouth washes. He prefers H_2O_2 for cleaning teeth to all tooth powders and mouth washes. If you put a little fine chalk on the tooth brush and pour over it a little H_2O_2, it will not only render the teeth brilliantly white, but it removes all injurious deposits on them. To apply once or twice a week is sufficient. If one adds to diluted H_2O_2, which one intends to use as a washing liquid, a couple of drops of aqua ammonia, one may see wherever this mixture touches the skin the small bubbles of oxygen which are disengaged, while the upper rough surface of the skin is transformed into a white soapy mass. As the H_2O_2 destroys nothing but the dead particles, it causes the healthy skin to appear, which quickly becomes strong and capable of resisting external influences.

THE UNION MEETING AT SPRINGFIELD.

The announcement in our last number of the Journal that the Massachusetts and the Connecticut Valley Dental Societies were to hold a union meeting in Springfield, Mass., June 6th, 7th and 8th, has created a wide and lively interest. We have letters from many sources promising attendance and participation. Some of the most prominent men in the profession are to take an active part in the proceedings, and our remark that this is to be one of the most important meetings ever held is to be verified.

The Executive Committee of the two societies are actively engaged in completing arrangements, and the full programme will be issued early in May. We are authorized to state that the following gentlemen will be present and read papers: Dr. W. C. Barrett, Buffalo, N. Y.; Dr. W. G. A. Bonwill, Philadelphia, Pa.; Dr. R. R. Andrews, Cambridge, Mass.; Drs. T. H. Chandler (probably) and D. M. Clapp, Boston, Mass., and Prof. Chas. Mayr, Springfield, Mass. Dr. Barrett will speak on "The experiments, observations and conclusions of Dr. W. D. Miller, of Berlin, Germany, concerning Dental Caries," to be illustrated by drawings and diagrams of his microscopical work. Drs. W. G. A. Bonwill; H. W. F. Buttner, of New York; H. A. Baker, of Boston, and (probably) E. P. Brown, of New York, will illustrate, by clinics, improved methods of "setting artificial crowns." These clinics will be a very important and practical feature of the meeting, and ample time will be afforded for the purpose. Prof. Chandler's paper will probably be on "Amalgams." The subjects of other papers are not yet announced.

Special rates at the various hotels have been secured, and an attempt is to be made to secure a reduction, if not free return tickets, from the various railroads, to members attending the meeting. The meetings will be held in Gill's Hall, corner of Main and Bridge streets. The profession are cordially invited to attend, whether members of either society or not.

Besides the parties above named, several chairmen of Sections of the Connecticut Valley Society will have reports to offer, and members of the Massachusetts Society will present papers on various topics.

Dr. Wm. H. Goddard, of Louisville, Ky., died, of consumption, March 4, 1883. He was for fourteen years treasurer of the American Dental Association, and at the last meeting was elected its president.

COOKING AND PARASITES.

We have all been shocked by the extremely barbarous habit practiced in many parts of Europe, but fortunately hardly known in this country, of eating anything from the hog without cooking it thoroughly. It would be ignorance unpardonable in a Kaffir not to have heard of the half a dozen of parasites which migrate from the hog into man by means of the meat.

The February Independent Practitioner contains a very able article on this very same subject; but it is not only pork which is so very dangerous in an uncooked form. Anything which may come in contact with the dejections of animals harboring parasites is equally dangerous. The habit of eating lettuce and dandelion, "gathered by the roadside," and fertilized by all kinds of domestic animals, without washing them sufficiently or without cooking at all, is equally dangerous. Even the drinking water in many communities ought never to be used without having undergone ebullition. People drink ice water without questioning where ice or water come from, and a great many of the diseases occurring quite frequently here, but being rather rare in Europe where people drink no water at all, seem to us to be due to this fact.

In countries where they drink nothing but weak fermented liquors, malaria is almost unknown; while in countries where people, either from notion or because it is fashionable, drink nothing but water, with perhaps occasionally some raw spirit called gin or whisky, it is of very frequent occurrence. The great difference between the savage and the civilized man lies in the process of cooking, and many of our beverages, like tea, etc., are more humbugging devices, to make us swallow boiled water, than anything else. Never drink any suspicious water without boiling it.

GUESSING.

It *is* a little like *guessing*, the attempt to estimate the weight of the "nascent" beast that even Dr. Watt cannot find. "Tracks," if even lifted by the "ears" and "tail" to the opposite end of the board, do not balance a very large pile of stones, to be sure. But how wonderfully fast their even *imaginary* weight does "peter out," as the hypothetical process is repeated. It's this "petering-out" process that counts, Dr., and not the first weighing. "And this journal *guesses* that" Dr. W. sees where the "shoe pinches."

"I am working hard," said to his teacher one of his pupils, the other day. "How much do you work?" "I worked seven hours yesterday." "Is that all?" "Is that not enough to ruin one's health?" "No, and ever no. Yes, if you commence with seven hours' hard work you will learn nothing, you will break down in a few weeks; but if you commence properly, with a few hours, you will find that ten hours of mental work, kept up for ten months in a year, will not hurt you. Once I was in a school where all nationalities were very well represented. In different respects they ranked as follows: The most intelligent were the Englishmen; next came the Northern Germans, next the Austrians and Southern Germans, then the Russians, then the Americans (some twenty-five pupils), then came a great gap, after which followed the French, Italians and Spaniards, in the order named. But when it came to work, there was no dispute. First of all stood the Northern Germans, next the Southern Germans, next the Austrians, then came a very great gap, after which followed the Americans, then the English, the Russians, the Spaniards, and, last of all, the Italians and French. "But what were the results?" There can be no doubt. In matter of learning, there stood highest the Germans and Austrians; next came the English and Russians; then came a very marked gap, after which came the Americans, followed by a very great gap which was closed up by the Italians, Spaniards and French, in the order named. At the bottom of the scale were the French, who were the most ignorant, conceited and incapable. The Americans were about in the middle. "How did they stand in regard to bodily development?" The best developed and handsomest youths were the Englishmen; next came the Americans, next the Northern Germans, next the Austrians, then the Russians, then came a great gap, closed by the Southern Germans, the French, Italians and Spaniards. "Who spent the most money, and in the most foolish manner?" The Americans and English; next came the Spaniards, next the Italians, then the French, then the Russians, then the Austrians, and the stingiest of all were the Northern Germans. The facility of spending money was almost in inverse ratio of the learning capacity of the boys. Only the superior intelligence saved the Americans and English from the wretched results attained by the French and Italians. "Who were the most orderly and best behaved?" The Americans and English in the school-room, the Germans and Austrians outside of the school-room, while the French and Italians had very much of Darwin's missing link outside the school-room as well as inside.

PYORRHŒA ALVEOLARIS.

Our readers will, we think, find it profitable to spend an evening in the study of our first article, "Pyorrhœa Alveolaris," by Adolph Witzel, Germany. We copy the article, almost entire, from the British Journal of Dental Science, omitting necessarily some of the cuts in the original, which are comparatively unimportant.

We are confident that a large number of our most careful and experienced operators feel that something more than mere *surgical* treatment is required in very many cases of this disease, in order that permanent results of a favorable character may be realized. We also know that some of our best men get results by following the surgical with an *intelligent antiseptic* treatment, never before obtained by other methods. We do not consider the Witzel method of treating this disease as antagonistic to the Riggs method, but, rather, as supplemental to it, at least in many cases; and our own experience is sufficient evidence that this supplemental antiseptic treatment is as necessary to a complete cure as the surgical.

But here, as elsewhere, the operator needs to thoroughly understand what is meant by the septic condition and antiseptic treatment, etc. Low organisms, gentlemen, have more to do with all the varied diseases that the dentist is called upon to treat than has been hitherto generally supposed, or even suspected; and no dentist can be considered as at all abreast with the times unless he understands therapeutics as related to septicism. Lacking this, he not only needs to "read up," in a general way, on this subject but, more than that, he wants to thoroughly *assimilate* principles or fundamental truths relating thereto.

It seems to us that the article in the April Number of the *Items of Interest*—"Separating the Teeth," by Dr. L. D. Shepard, of Boston, has a *surprisingly* familiar appearance. We think that we have seen it before, somewhere, Mr. Editor.

"In the genuine 'white decay,' he"—the dentist—"cannot be too thorough and careful with his antiseptic treatment."—*Dr. Watt in the April No. of the Ohio State Journal.*

Well! Well!

Dentist Bernhardt Herschenröder, in Hamburg, had a case before court worth relating because of showing a law point in Germany. A child was sent to him because of toothache. The dentist was feeling with his finger in the mouth of the child; as it pained the boy, he bit it. The dentist at that cuffed his ear. The result of these mutual proceedings in both parties were visible after eight days. But the court was against the dentist, and for the boy, who had done the biting. The dentist had to pay seven dollars fine.

Operating Table and Laboratory.

ROBINSON'S FIBROUS FOIL.

It would seem that the demand for *varieties* of filling materials, at least, would soon be filled, though perhaps we ought not to look for rest in this direction till the grand *Ideal* filling material is discovered. As long as the search for the *Ideal* continues, there will doubtless be the many, at first promising, but soon proving anything but the long sought, placed on the market.

Though the *Fibrous Foil* is not claimed to be the *Ideal*, we most sincerely believe it has merit, and to so great an extent that it will *force its way to the operating case* and into many a tooth. We have given it a trial in quite a good many cases, and, on becoming accustomed to working it, are much pleased. Gold welds to it readily, and in those cases of teeth with frail walls, when gold properly condensed would endanger fracture, this being so much more plastic, can be used with safety, and the surface thinly covered with gold, thus obtaining the excellencies of each. In obscure cavities, it of course need not necessarily be overlaid with gold.

We have found in our own practice that where it is desired to overlay with gold, it is best to fill the cavity *completely* with the fibrous foil, then with files or scrapers finish down to but a trifle less than the contour desired when finished; then, with a fine sharp excavator, scratch up the surface. With the first layer of gold, use moderately coarse and sharply serrated points as packers, after which smooth points may be used. We prefer that the felt should come to the *very margin* of the cavity, feeling that this will insure greater safety (both as to leakage and fracture) than to make the weld *inside* the margin.

As a lining for rubber plates, we have given the material no trial. A specimen plate looks quite nicely, and we feel assured, from its appearance, it must be more healthful in contact with the mouth than the plain rubber. We can commend it as a filling material, at least, as well worthy an earnest trial.

The London Medical Record concludes from Prof. Koch's experiments that the only certain disinfectants are chlorine, bromine and corrosive sublimate. Solutions of one part of the latter to 1,000 parts of water will kill spores in ten minutes, while a solution of one in 15,000 is strong enough to arrest the power of development in micro-organisms.

INFLUENCE OF MIND OVER BODY.

BY C. J. B. WALLIS, L. D. S., ENGLAND.

Mr. Stephenson's case—"Electricity and Dentistry"—mentioned in the last number of the Record, reminds me of a similar case I had sometime ago, but with N. O. gas, instead of the electric current. A lady called and wished me to remove a painful upper molar under gas. The gas apparatus was arranged, the inhaler adjusted, and the gas turned on; in a second or two the patient breathed deeply, and her eyes, very widely open, were fixedly gazing on the ceiling. After the patient had inhaled a very large quantity of gas, as I thought, without any decided effect upon the sensitiveness of the eye or the beating of the pulse, I decided to operate without speaking to the patient, for she was evidently not under the influence of the gas, and in due course removed the tooth. The patient immediately leaned forward, without the least excitement or show of pain, and washed the mouth. The whole conduct of the patient rather puzzled me, so that I was curious to know her experience, and on inquiry she informed me that the "gas was not at all unpleasant, as she expected it would be," and that she "felt just a little pain at the last moment, but nothing worth mentioning." She paid the fee, and left apparently well pleased with the success of the operation.

Now, as I felt perfectly certain that the patient was conscious the whole time, I came to the conclusion that there was something wrong with the gas; therefore I took the earliest opportunity, after she had left, to examine my apparatus, and was astonished, as well as amused, to find that I had omitted to connect the tubing with the gas bottles, so that it was impossible that the patient could have inhaled any more gas than I had myself inhaled at the time from the gas circulating in the room.

This case not only bears upon the question of the influence of the mind over the body, but also bears out the theory that deep and rapid inspirations produce a certain amount of anæsthesia.—*The Dental Record.*

We have in several instances succeeded in extracting a single tooth with almost no, if any, pain to the patient, by preceding the operation with deep and rapid inspirations for about two minutes. It is not a success in all cases, of course, and too much must not be expected. If, at the same time, the patient can be induced to bring the muscles and nerves of the body into a vigorous rigid tension, it will aid in producing the apparent anæsthetic condition.—Ed.

BAD TEETH AND NERVOUS TROUBLES.

The following we quote from a late issue of the *New York Times*. It is an article of much interest, and should be read with care. It seems to us, however, to be liable to convey an erroneous impression, at least upon a hasty reading. Our anti-amalgam friends want to "think twice" before they claim it as a "score" on their side of the question. There is more in it than merely amalgam. It is to be regretted that these cases were not reported by some one competent to give us an exact and full statement of all the conditions of the parts locally affected. There can be no doubt that diseased teeth cause more trouble of this character than is generally supposed, even by dentists:

"It appears not to be generally understood even among cultivated people, nevertheless, although the fact has been dwelt upon with emphasis by the best medical authorities, that the presence of carious, crowded or asymmetrical teeth in the human mouth is the progenitor of a long train of nervous diseases, comprising not only facial neuralgia and its concomitant troubles, but diseases of the ear, inflammatory as well as functional, eventuating often in partial loss of hearing, defects of vision, naso-pharyngeal catarrh, and other tormenting maladies. One of our acutest and most successful specialists in the treatment of nervous diseases has become so fully convinced by long experience of the part played by defective teeth in the development, not of neuralgia only, but even of the more obscure neuroses, that he always insists, as a condition precedent to the acceptance of the case, that a thorough examination of the cavity of the mouth shall be undertaken by a competent dentist, for, he says, not only may a single diseased tooth result in persistent nervous disturbance, but diseases of the brain, decay or perversion of the mental faculties, even epilepsy and tetatnic spasms often have their starting-point in dental irritations; and he has observed cases in which, while laying the foundation for a long train of nervous troubles, the irritated organ itself gave no sign, either by local pain or vague discomfort, of the agency it was constantly exerting to produce serious disturbance at some distant point. In common with most aural surgeons, Dr. Sexton has long since adopted the practice of examining the teeth of every patient brought to him for treatment of ear trouble, particularly of partial deafness and of general irritation of the organ; and, speaking the other day of the large number of pupils from the public schools who attended the aural clinics at the hospital with which he is connected, 'it is rare,' he said, 'to find a

single patient in whose case dental irritation is not to be considered among the prominent causative factors.'

"But is it possible that *mental* decay should have its starting-point in dental irritation? This question is answered by a remarkable case narrated by a prominent dentist in this city—Dr. Smith, of No. 50 East Twenty-third street. The patient was a gentleman from Boston, about 35 years of age, the senior partner in a prosperous dry-goods house. Several years previous to the date when he came under the care of Dr. Smith his general health began to fail inexplicably. Medical advice, tonics and stimulants were equally without avail. The trouble was diagnosticated as nervous exhaustion; he was advised to pass a year in Europe; did so, and returned in no way improved. A constant victim to neuralgia and sleeplessness, his friends soon noticed with anxiety the development of symptoms of cerebral disturbance. Fits of mental aberration followed, and finally symptoms of progressive dementia set in. The best physicians in Boston and New York were alike baffled by the obscure and inexplicable features of the case. The patient failed gradually, but steadily, in mind as well as body, and in both equally. Accident, or rather the occasion to have a defective tooth repaired, brought the patient in contact with the dentist, who discovered, in addition to the services required, that in two teeth that had been filled with amalgam some years before, decay had set in beneath the plugs. The latter were accordingly removed, the cavities cleansed, and a filling of gold-foil was substituted in each case. Strange to say, from the date of the removal of these plugs, the symptoms of mental decay began to disappear, the physical condition of the patient rapidly improved, and in a few weeks, without further medical interference, he was a well man and capable of attending to business. It is a curious fact that neither of the two teeth which were responsible for the train of nervous and cerebral disasters wherewith this gentleman had suffered for years had ever given the least local trouble since it was filled. Whether the amalgam acted as a poison upon the delicate nerve bud beneath, or whether direct pressure upon the nerve was the cause of the irritation, medical science was incompetent to decide, but it is an assured fact that the progressive *mental* decay had its starting-point in the two minute nervous filaments connecting these organs with the brain, and there is no doubt that the case would have terminated in dementia if the amalgam plugs had not been removed and the cavities properly filled.

"Another case—that of a gentleman whose name has since become

familiar in literature—will serve to point the moral of the preceding. At the age of 18, his mouth being in other respects healthy, this gentleman had one of the large double teeth of the lower jaw plugged with amalgam by a country dentist. The tooth blackened, but no local inconvenience followed. A few days after the operation he was prostrated with what his physician described as nervous fever, high temperature and persistent delirium being among the prominent symptoms. Dating from this fever, and occurring with annual regularity nearly on the anniversary of the first attack, for the next ten years the patient was tormented, usually for about five weeks, with the most fearful neuralgia of the right eye and the right temple, which his physician predicted would finally end in loss of vision and possibly in brain trouble. At length, in the torment of a paroxysm, his attendant being absent, he threw himself one day upon the sofa, and placed over his nostrils a napkin saturated with sulphuric ether. As the anæsthetic took effect and the pain subsided in the eye and temporal regions, he was surprised by a curious sensation as of a thread of pain running along the jaw and ending in the tooth which had been filled years before, but had never given the least hint of local discontent. On relating the experience to his physician, the wary practitioner was sensible to advise the removal of the plug and refilling of the tooth. This was done. The neuralgia vanished in an hour and, though several years have elapsed since then, it has never returned."

BRUSHING THE GUMS.

In our article in this number by Adolph Witzel, attention is called to the importance of brushing the gums with a soft brush and carbolized "spirit," or water, as a prophylaxis. We are confident that too little attention has been given to this matter. That the brush should be a soft one, is self-evident—softer than those in general use for cleansing the teeth. If the concretions about the necks of the teeth are to be considered as the cause, or favorable conditions to the development of pyorrhœa alveolaris, the removal of such concretions is certainly in the line of prophylactic treatment, and cannot be too carefully insisted upon. That this collection of mucus and food substances about the margins of the gums is productive of germ development to a high degree, there can be no doubt—to antagonize which the use of carbolized water is very efficient, and should not be left out of the dental toilet.

In marked cases of predisposition to gum disease we have, for

some time used, with very favorable results, a solution of glycerine, carbolic acid and eucalyptol, flavored with the oil of winter-green—not only brushing the teeth and gums with this solution, but afterwards thoroughly rinsing the mouth with the same. Also, in cases of "rapid decay," especially with our young patients, we prescribe a similar wash to be used daily. We *think* good results follow.

CATCHING THE TOOTHACHE.

A gentleman once was in the room with a lady who was having a severe toothache, and had suffered long with it, when all at once he sprang to his feet and clutched his face and exclaimed that he had a fearful toothache. At the same moment the lady told him hers had stopped aching. The lady's tooth troubled no more, but the gentleman got no relief until he had his tooth extracted.

A. J. P.

SOCIETIES.

VERMONT DENTAL SOCIETY.

The seventh annual meeting of this society met in the parlors of the Bates House, Rutland, March 21, and closed its work on the 23d, President S. D. Hodge, of Burlington, in the chair. The session of Wednesday, the 21st, was occupied mainly by the reception of reports of various committees, among which was that of "Legislation," who report the enactment of a law regulating the practice of dentistry in the State, and also articles of association, which constitute the society an incorporate body. The balance of the evening was devoted to a paper on "Bacteria," which was presented by C. S. Boynton, M. D., of Brandon, Vt. This paper was by vote of the society returned to the author to continue some experiments, with the request that it be extended and, when completed, published by the society for distribution.

Below we give an abstract of the paper.

The essayist began by saying that, in coming before them at the invitation of their executive committee, to present a paper on the subject of "Bacteria," he came not in the interest of any particular theory or hobby; that, in his description of the characteristics of bacteria, he should make no pretensions to originality, the object be-

ing to give the life-history of these organisms as far as known to the present writing; to explain natural facts in simple and unmistakable language, clearly defining the position they now occupy in the scientific world; and also to place before them as clearly as may be the part they now (in the opinion of many of the dental profession) play in the production of dental caries.

After speaking of the interest attached to the study of these organisms as touching the most diverse problems, related as it is to the theory of spontaneous generation, to that of the fermentation, to the pathogeny and therapeutics of a great number of virulent and contagious affections, and in a more general manner to all the unknown, which, notwithstanding the efforts of modern science, still surrounds the origin of life and its preservation, he called attention to the fact that organized material cannot again enter the general current until it has undergone new transformation, which transformation, without contradiction, is accompanied by the development of bacteria, and—strong proof seems to be in favor of saying—produced by them. And it may be said that, because of them, the continuation of life is possible on the surface of the globe.

Then followed a description of their botanical characteristics (for Dr. B. claims for them a plant origin), together with their present classification. He referred briefly to the discoveries of Leeuwenhock, Devaine, Hoffman, Hallier, Cohn, Pasteur, and others. Bacteria, after migrating from one kingdom to another, and being "kicked" out by one observer from both vegetal and animal, as not belonging to living beings, at last are classed by Sachs as "Thalophytes," a group formed by uniting the algæ and fungi, in which he establishes two parallel series, one possessing forms containing chlorophyll, the other destitute of it.

They multiply in moist air wherever they can find decaying matter; are killed by a temperature of 140° F., only the temperature must be continued long enough to make sure that the whole mass has been penetrated and not a single bacterium has escaped destruction.

If the bacteria in a solution are killed and the introduction of new germs prevented, the liquid remains unchanged, putrefaction never takes place.

Thus it is concluded, from experiments often repeated and always with the same results, that putrefaction does not take place if no bacteria are present; and, on the other hand, the multiplication of them ceases as soon as the substances capable of producing putrefaction are destroyed.

Therefore, bacteria are not the chance companions, but rather the cause, of putrefaction, which is defined to be "a chemical process excited by bacteria." Death does not cause putrefaction but rather it is caused by the life of these invisible organisms.

As soon as Leeuwenhock made known his first observations upon these invisible organisms in putrid rain water, many of the doctors of that day began immediately promulgating the hypothesis: That the frightful enigma of epidemic diseases was explained through the wafting of microscopical diseased germs. And not only the "doctors," but the "dentists" have had from time to time slight attacks of what may be termed "Bacteria-mania."

The discovery of these low forms of life in the mouth is not of modern origin, as can be seen by an extract from the writings of Leeuwenhock, in 1682. If he has not named them, it is easy to assure oneself, by the description he has given of the form and movements, that the organisms observed by him are truly bacteria. When we consider that this description was written over two hundred years ago, and at a time when microscopy was little known, we feel that the words of holy writ are true: "There is no new thing under the sun."

Dr. B. here gave the circumstances which turned his attention to the subject of dental caries as produced by bacteria (by a notice in the Boston Globe of December 16, 1881, of an interview with Dr. F. Y. Clark by a New York reporter). After giving the contents of a note from Dr. Clark, he said: "Here we find two landmarks just two hundred years apart—1682 and 1882; let us turn back and see what has been done by other investigators between these dates."

The investigations of Alex Beneditti Musitamus, Peter Fanchard, John Hunter, Ficinus, Klencke, J. Tomes, Neumann, Magitot, Leber and Rottenstein, were in turn noticed, and coming to the present time mention was made of the labors of Drs. F. Y. Clark, A. Weil, Arthur S. Underwood, W. J. Milles, W. D. Miller, C. T. Stockwell, and many unknown writers in the recent dental journals. While the last-mentioned gentlemen might not agree on all points touching the rôle of bacteria in caries, they probably could agree with Miller when he says: "In my opinion there is not a single case of caries in which micro-organisms do not play some part, and that in the most cases they play a very important part."

"After going over the literature of the subject, the investigator or seeker for truth finds himself in the position of the student who entered the old hall of 'Sorbonne,' in company with the Genevian

Professor Casaubon. 'Here,' said the student proudly, 'is a building in which men have disputed for four hundred years.' 'And,' asked Casaubon, 'What has been settled?'

There is a significance in the question of the old professor. No question of this kind can be settled by a war of words. Patient, continued research, in which all who can should take a part, will bring in time better results and place the profession on a higher plane."

Reference was made to the questions propounded by Dr. Frank Abbott to Dr. F. Y. Clark, as reported in the March number of the N. E. Journal of Dentistry, as embodying the reasons why he cannot accept the germ theory as correct.

In all of the discussions that have appeared in the journals since the germ theory of dental caries has been brought forward, it has been noticed that the opponents of the theory, and sometimes the supporters, come to the work without any definite knowledge of the life history of bacteria; and this is the reason why so much space has been given this part of the subject in this paper, believing that in order to find what these organisms are responsible for, we must first find their true place and purpose in the economy of nature.

People are found talking of bacteria of the "mouth" and "teeth" as though they were a genus by themselves—something especially created for the sole purpose of tormenting the patient and bothering the dentist, and endowed with no other object in life but to bore, break down and destroy our teeth, from a spirit of innate wickedness with which they are possessed.

If these persons had made themselves familiar with the biological history of bacteria, as they exist elsewhere, following carefully the rôle they perform in the world of organized beings, many questions would remain unasked and the number of honest doubters would be less. We learn that the body in which life has been extinguished succumbs to dissolution in order that its material may become serviceable to new life.

"If there were no bacteria, the materials embodied in animals and plants of one generation would, after their decease, remain bound as the chemical combinations in the rocks; new life could not develop because there would be lack of body material. Since bacteria cause the dead body to come to the earth in rapid putrefaction, they alone cause the springing forth of new life, and therefore make the continuance of living creatures possible."

"The great bulk of plants derive their nourishment from inorganic

matter, elaborated by them from the crude materials in the soil, and stored up in their cells, as starch, diastase, chlorophyll, etc."

Animals depend, on the other hand, in as great a degree upon materials elaborated by vegetal chemism. They depend mainly upon the starch and gluten of plants in one form or another. Suppose this double drain on organic nature to be continued with no return. How long would life exist?

The farmers are learning a lesson at this late day that they cannot demand food from the soil without rendering some return. The fertilizers with which they enrich their worn-out acres are nothing more than materials which, by the aid of bacteria, have completed the circle of nutrition. "Material taken from the earth in the first place forms plant tissue, this in turn is appropriated by the animal economy, and these animals yield themselves up at last to the soil which takes back its own."

Here we find the life work of bacteria, placed by nature everywhere, so they may well be called omnipresent, nature's sentinels on the picket line of life, ever watchful to execute their mission whenever and wherever natural causes make way for them. But with all their power and eagerness to lay hold of organized material, there is placed an impassable barrier between them and organic life; the principle of vitality holds them in check. As long as the organized material with which they are associated is possessed with its normal vital powers, so long will it be free from their ravages. Here is thought to be the true part which they play in the production of dental caries. There is a breaking down or lowering of the *vitality* of the structure, in whole or in part, and then bacteria begin their work. Much stress has been laid on the action of acids, but may not any disease that lowers the vital powers assist in bringing about this result? This part of the subject was illustrated by cases which would seem to prove that caries was of a complex nature, and that it would be useless to search for any one cause that could produce all these changes.

[The "Breaking down or lowering of the *vitality* of the structure" cannot be said to be *caries* but, rather, a *favorable condition to* caries; or a condition when bacteria may *successfully* attack the structure, at which point the processes of caries are set in motion. In other words, there is no *caries* until the *putrefactive* process is inaugurated by the agency of bacteria. The causes of the various *conditions favorable to* caries may be, and are, "complex;" but any one or all of these do not alone constitute caries proper; they stop short of it.

So far, no *caries* exist. The structure or tissue may be even dead, but not carious. The cause of *caries* has not yet appeared on the scene of action. Admit the bacteria, and then you have caries as a natural result.—Ed.]

In conclusion, he said: "We leave the subject with you, hoping that enough has been said to induce you to follow out this inquiry in the spirit of the motto of the Cosmos—'Observe, compare, reflect, record.' *Observe* carefully what is going on each day before your eyes. *Compare* these observations with others working in the same field. *Reflect* upon the data obtained, and learn if possible the lessons taught, remembering that 'He who never walks save where he sees men's tracks, makes no discoveries.' And lastly keep a *record* of each day's progress, as it is by these written records that the march of progress is made universal."

A vote of thanks was extended to the doctor for his paper and a general discussion followed, evincing much interest in the subject.

The session of Thursday morning was occupied by the reception of new members—thirteen in all—the consideration of the subject of "Dental Caries," and its treatment, and in listening to a report by Dr. Lewis, of the National Examiners' Convention recently held at Lexington, Ky.

The afternoon session was opened by the reading of a paper on "Dental Education," by Dr. S. J. Andres, of Montreal. The concluding clause of this paper gives expression to the hope that the day is near "when the societies of the different States will fraternize and have, as far as possible, a uniform law governing them in regard to the qualifications to be demanded of the students as well as the course of examinations they will give. They will then be in a position to recognize and accept the licenses granted by each society and admit to practice the persons possessing them."

The treatment of alveolar abscesses was presented by Drs. Gilmore and Campbell, and Dr. Wellington explained his method of filling devitalized teeth, after which Dr. S. D. Hodge, the president, read the "annual address."

At the evening session Drs. Hodge and Chase explained the principle of the Coffin method of regulating teeth, Drs. Boynton and Wellington were elected to honorary membership, and a collation followed.

On Friday morning the following officers were elected and installed for the ensuing year: President, Dr. O. P. Forbush, Montpelier;

Vice-Presidents, Drs. R. M. Chase and W. H. Wright; Secretary, Dr. T. Mound, Rutland; Treasurer, Dr. James Lewis; Executive Committee, Drs. G. H. Swift, Manchester, W. H. Munsill, C. F. Lewis.

Voted, to hold the next meeting at St. Albans.

AMERICAN MEDICAL ASSOCIATION.

Section on Dental and Oral Surgery.

The thirty-fourth annual session will be held in Cleveland, Ohio, commencing Tuesday, June 5, 1883, at 11 A. M., and continuing four days.

"The delegates shall receive their appointments from permanently organized State Medical Societies and such County and District Medical Societies as are recognized *by representation in their respective State Societies* and from the Medical department of the Army and Navy, and the Marine Hospital Service of the United States."

All medical men of the regular school practicing the specialty of Dental Surgery are most cordially invited to procure credentials from their local medical societies and join us at Cleveland. Railroads furnish reduced rates to all members wishing to attend.

"A member desiring to read a paper before any section, should forward the paper or its title (in length not to exceed twenty minutes in reading) to the chairman of the committee of arrangements, at least one month before the meeting."—(By-Law.)

TRUMAN W. BROPHY, *Secretary*
Section on Dental and Oral Surgery, Am. Med. Association.

ALABAMA DENTAL ASSOCIATION.

The fifteenth annual meeting of the Alabama Dental Association was held in Montgomery, Ala., April 10, 11, and 12, 1883, at McDonald's Opera House—Dr. J. C. Johnston, President, in the chair. The following officers were elected for the ensuing year:

Dr. E. S. Chisholm, President.
Dr. R. U. DuBois, 1st Vice-President
Dr. W. R. McWilliams, 2nd Vice-President.
D. E. Wagner, Secretary.
Dr. G. M. Rousseau, Treasurer.

Drs. E. S. Chisholm, E. Wagner, S. Ramba, W. D. Dunlap and A. Eubank, Executive Committee.

Drs. W. R. McWilliams, A. Eubank, J. C. Johnston, W. B. Stewart, J. G. McAuley, State Board of Dental Examiners.

E. WAGNER, D. D. S., *Sec'y*,
Montgomery, Ala.

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ORIGINAL COMMUNICATIONS.

A HISTORY OF DENTISTRY FROM THE EARLIEST PERIOD TO THE PRESENT TIME.

BY GEORGE H. PERINE, D. D. S., NEW YORK.

DENTISTRY AMONG THE ANCIENT EGYPTIANS, ARABS, AND GREEKS.

In preparing a history of any art, it is the time-honored custom for the writer to search for its origin among the crumbling ruins of Italy, Greece or Egypt. To the builders of the pyramids, and the occupants of the massive and enduring tombs, which arise upon every hand along the banks of the Nile,—silent and sad reminders of man's mental and physical power and brief existence,—we naturally turn for the germ which has developed into an art or science of vast magnitude and utility at the present day. Historians have left us but limited material from which to cull facts with which to open a history of this character. Among the rude carvings and pictures of antiquity we find but little suggestive of dentistry, although in the ruins of Pompeii and Herculaneum, and the buried cities of the western hemisphere, dental instruments somewhat resembling those in use at the present day have been discovered.

Herodotus, who lived five hundred years prior to the beginning of the Christian era, and was the oldest Greek writer whose works are

extant, and the first among ancients to refer to the teeth in connection with the healing art, informs us that in his day there were in Egypt those who practiced certain specialties in medicine. Some turned their attention solely to the treatment of the eyes, others to the head generally, and some to the teeth only. An examination of the teeth of mummies fully confirms Herodotus' statement, for it proves to us beyond a doubt that dentistry was practiced—and by no means indifferently—by the ancient Egyptians, who were likely the first to give it attention as a specialty. Both filled and artificial teeth have been found in the mouths of mummies, the cavities in the former stopped with gold, and in some cases with gilded wood. Whether these fillings were inserted during life for the purpose of preserving the teeth, or after death for ornamentation, it is of course impossible to say. That the Egyptians were exceedingly fond of embellishing their persons with gold ornaments and bright-colored materials is a fact which has been clearly established, and the discovery of mummies—of exalted personages, no doubt—some organs of which were gilded and embellished with showy colors, proves that their fondness for display accompanied them even into the grave. Generally speaking, the teeth of Egyptian mummies have been found to be in a comparatively sound state; hence, it is likely the dental practitioner in the land of the Nile not infrequently experienced a sad lack of patients, and the encouragement he received consequently for the practice of his profession was limited. The teeth of a female mummy, purchased by M. Villotean at Journey, on the Nile, proved to be all present, and although they were worn down apparently from old age, were without exception free from decay. At the present day the Egyptians are noted for their good teeth, which are remarkable for their durability, seldom failing with old age. The replacement of lost teeth appears to have been practiced from an early date by both Egyptians and Hindoos. Belzoni and others have found in ancient Sarcophagi artificial teeth made from sycamore wood. It is also quite likely that ivory constituted a favorite material for the manufacture of teeth in the East, as it was so extensively used for various purposes by the people of that locality. Such artificial teeth as we refer to were probably held in place by ligatures, bands of cord, or gold and silver wire, which bound them to their natural neighbors.

Cicero, quoting from the *Law of the Twelve Tables*, says: "Let no gold be used, but if any one has had his teeth fastened with gold, let it be lawful to bury or burn that gold with the body."

In the museums of Paris and Berlin may be seen artificial teeth of Egyptian origin. Joseph Mayer, F. R. S., of Liverpool, is the possessor of an extensive and highly valuable collection of antiquities, among which are two pieces of artificial denture, one consisting of five teeth carved from bone, the other of two teeth of sycamore wood set in gold. Dr. Purland has also in his collection a tooth which was found pivoted to a stump in the head of a mummy.

Cases are related by Heradides, of Tarentum, and Herophilus, who practiced dentistry about 300 years before Christ, of persons who have died from the effects of the extraction of teeth.

Hippocrates was born at Cos, 460 B. C., and was the first writer who refers to the use of the actual cautery in the removal of teeth (which practice was very likely borrowed from the Egyptians, whose preference for the use of heated iron, etc., is well known), compounded remedies for fetid breath, and removing discoloration from the teeth. He also explains how artificial teeth may be held in place by the employment of gold wire. His plan was, however, by no means original, for, as we have previously stated, the Egyptians undoubtedly resorted to a similar practice centuries before Hippocrates lived. That the ancients devoted particular attention to the care of their teeth may be inferred from the fact that not only Hippocrates but others, among whom we may mention Democritus and Mepalinus, made and used dentifrices. The former obtained his formula from a little book called Pythicus, which was written in verse, and derived its name from its author.

Erasostratus is credited with having deposited in the temple of Apollo, at Delphi, a "leaden tooth-drawer," as an indication of his opposition to the practice of extracting teeth not loose enough to be removed with the fingers. Indeed, it would appear that extraction was an operation by no means in favor with the ancients. Judging from the bas-reliefs and frescoes found at Thebe and Memphis, the instruments employed in dentistry in the early ages were decidedly primitive and clumsy. And in all cases where illustrations of dental operations have been discovered, the instruments represented are huge engines of torture, while the suffering of the person undergoing the operation is clearly depicted.

The early lessons in physiology, and the principles of pathology as given us by Aristotle, have proved of much value, and have left us greatly indebted to that staid old student, who lived 350 years before the beginning of the Christian era. Many of his principles are

accepted at the present day, particularly those which have contributed toward the foundation of our profession. He was not, however, in his judgment or opinions infallible, as is proved by his assertion that man has more teeth than woman, and that the same difference exists between the sexes of various classes of animals; and, again, that the teeth increase in length during life, which marks the difference between them and other bones.

Celsus, who was a celebrated physician of Rome, was perhaps the first to recommend the file for the removal of caries of the teeth. His ideas regarding the treatment of the teeth were of an advanced character; indeed, he was the first to give scientific directions with regard to the extraction of teeth, which operation, however, he advised only in extreme cases. We find that he advocated the filling of decayed teeth, for which purpose he employed lead and other substances, and that he also advised the scarifying of the gums.

That comparatively little is found in the literature of ancient Greece and Rome, and still less in that of Egypt relating to the subject of dentistry, is a fact by no means surprising, notwithstanding we have conclusive evidence that the specialty was extensively practiced, for the reason that the fundamental principles of the healing art were enveloped in a vail of mystery, or hid, as it were, beneath a halo of superstition. Practitioners were held in great reverence by the people generally, and in order to retain their power, which undoubtedly elevated them in the social scale, they guarded their knowledge with religious zeal. The secrets of the profession were handed down from father to son through generation after generation. From the law of Hippocrates we quote the following:

"Holy things are communicated only to the initiated; but they must not be trusted to the profane before they have been initiated into the orgies of science."

That Hippocrates did not, however, follow to the letter his own precepts, is evident from the information he has given us of his knowledge and theories regarding the structure and origin of the teeth.

The opposition which existed among the Egyptians and Romans to such an extent against the operation of extraction, we find to be equally as strong with the Greeks and Arabs. Nowhere does Homer in his writings refer to it, which leads us to believe that it was rarely if ever performed in his time, although fillings are believed to have been not unfrequently made. In the Archælogical Museum, London, are several skulls of ancient Greeks, the teeth of which contain a stone-

like filling. This fact furnishes strong evidence in favor of the impression which now exists regarding the practice of dentistry in Greece in past ages.

The Arabs and Greeks were both strong advocates of the application of the actual cautery as a remedy for diseases of the teeth and gums, but the former people did not admit of the possibility of supplying the place of lost teeth with those of an artificial character, although there were not wanting practitioners who recommended their use.

Herophilus, also Erasostratus, gave the teeth much of their consideration, and made them the subject of many of their writings, and the discoveries they made and the knowledge they imparted to the world have proved of great value to science.

The operation of amputating an arm, which was made before the Alexandrian court and several medical experts of the time, and from which the patient recovered, established in the mind of Herophilus the opinion that a tooth could be extracted without danger or serious inconvenience to the subject of the operation.

The Arabs adopted several methods for the removal of teeth without pain, but not, we opine, without injury to the victim of their practice.

Aaron, a physician who practiced his profession in Alexandria, used for this purpose colycinth. The Romans also prepared various chemical preparations for disintegrating and destroying troublesome teeth, or causing them to loosen and drop out. And it is recorded by the Latin poet, Martial, that the Roman ladies wore artificial teeth and were by no means opposed to them.

Albucassis, an Arabian physician, who lived about A. D. 1100, was from all accounts the first to recommend the transplanting of teeth; hence, it is clear that this practice was comparatively of modern origin. The following, which we quote from Pliny's Natural History, may not prove uninteresting:

"It is a matter beyond doubt that in young children the front teeth are produced at the seventh month, and nearly always those in the upper jaw first. These are shed in the seventh year, and are then replaced by others. Some infants are even born with teeth. Such was the case with Marius Curius, who, from this circumstance, received the name of Dentatus; and also with Cer. Papirius Carbo, both of them distinguished men. When this phenomenon happened in the case of a female, it was looked upon in the time of the kings as an

omen of some inauspicious event. . . . Some persons are born with a continuous bone in their mouth in the place of teeth; this was the case with the upper jaw of the son of Prusius, king of Bithynia. The teeth are the only parts of the body which resist the action of fire, and are not consumed along with the rest of it. Still, however, though they are able thus to resist flame, they become corroded by a morbid state of the saliva. The teeth are whitened by certain medical agents. They are worn down by use, and fail in some persons long before any other part of the body."

That dentistry constituted an acknowledged and important branch of medical science among the ancients is a fact clearly established, and that it was extensively practiced and by no means unsuccessfully, the records of the past which have been handed down to us, and the evidences which the tombs of those who lived in ages extremely remote to ours have yielded, furnish undoubted proof.

[To be continued.]

WHAT IS THE VITALITY OF A TOOTH?

BY CHARLES MAYR, SPRINGFIELD, MASS.

We often hear the expressions, "lowered vitality," "reduced vitality," "great vitality." What exact meaning and sense can we give to those words? To understand our explanation of those terms, one has to accept our explanation of what vital force is: *Vital force in a tissue is the resultant of all the forces active in that tissue of whose particular vital force we speak.* Thus, e.g., the vital force in the stomach is the resultant of the forces in the following components: the gross outer structure, the three different layers, the gravity, the circulation, the quality of the blood.

Those are the grossly mechanical outer factors. Then come the, so to speak, microscopical factors, viz.: The structure of the three layers, the arrangement of the different glands, the structure of those glands, the nature of the reticulum, and finally the size and quality of the reticulum.

Each of those factors is again a compound of many smaller factors, and thus our vital force in the stomach becomes an extremely complicated total.

Let us take the tooth. What is the vital force in a tooth? It is the resultant of all the forces therein. The very vitality of a tooth may prove its destructive or conservative element. The following factors

of the vital force in a tooth are important to us: Its chemical composition, its mechanical arrangement, its circulation. (About the first we know in detail only a little to a certain point.) We know the proportion of lime-salts and organic substance in dried teeth; some experiments have been made with live teeth, etc. The vitality of a tooth may be said to depend on those three factors, and changes in them will produce certain changes in the "vitality" of a tooth, viz.: Changes in the composition, changes in the mechanical structure, and finally changes in its circulation. The last is the most important factor of all the changes. The first two factors are more what we may term congenital factors, while the last depends on other circumstances. We may, therefore, for a moment neglect changes in composition and structure and chiefly consider the changes of the circulation, which is most likely to vary. We can no longer doubt that the most important element in the composition of a tooth is the organic albuminous protoplasm; called thus far as chemical processes are concerned,—or called bioplasson as far as its structure and the mechanical processes in it are being considered. The nature of this bioplasson can probably not alter much in its mechanical arrangement, this being given by the canaliculi of the tooth, but its composition may change. If we have two persons, say both weighing 180 pounds, the one a flabby, "fleshy" woman, the other a strong, healthy man, what is the difference? The bones? Not so much—hardly two pounds more in one case than in the other. The difference is in the water and fat; both are inert as far as the real working and superintending of the system is concerned; all the brain work of the system is done in the last instance by the protoplasmatic elements of the tissue, and there is where the difference comes in. The fat woman is made up of inert water and fat, while the healthy man shows a larger percentage of albuminous elements. The general structure of the reticulum in both bodies is very nearly the same, but the matter compounding it is stronger in the latter case than in the former, because of its greater concentration. Suppose the thigh muscles of both parties to be weighed, and both be found to weigh the same amount, the muscles in the first person will be composed of 90 per cent. fat and water, and 10 per cent. albumen; in the second person, of 75 per cent. fat and water, and 25 per cent. albumen. The second person will be two and one-half times stronger than the first because he has two and one-half times more organic albuminous substance, because the threads of the reticulum in the muscles probably owe their strength to the albuminous matter alone, and but little to the

water and fat. This will illustrate what we understand by vitality of teeth. What we said about the fat woman and the strong man is only an illustration, and an analogy of very close resemblance because of its dealing with the same working principle with the bioplasson. What are teeth with great vitality and teeth with low vitality? The first are teeth whose reticulum contains relatively little water and inert substances, while the second are teeth whose reticulum of bioplasson contains very much water. As albumen, however, has nearly the specific gravity of water, the weight of a tooth will not be changed very much by such a change in the composition, and the gross analysis for the lime-salts alone is not affected at all by those changes. *The proportion of water to protoplasm in a tooth is a very sure measure of its "vitality."* We have the more "vitality" the greater the percentage of albuminous substance to water. From this standpoint we can explain the lowering of vitality of teeth in consequence of diseases that affect the rest of the body. During all diseases we live more or less on our own meat. The brain is the last organ—the chief of the body—that will show a loss; all the other organs are eaten up in supplying the brain, and just as the muscles of a starving person shrink because the brain eats them up, thus also the bioplasson shreds of a tooth will shrink because the brain will eat it up; but the shrinkage will not bring in its course a diminution of the volume of the tooth. The structure does not allow of that very much; the vacuum will be filled out with water. Starving persons, as it is well known, drink large quantities of water, and if they are allowed an unlimited supply of water they are able to stand hunger many days longer than when deprived of it. While the albuminous and fatty contents of the tissues are consumed, water is taken into their place. Thus also with teeth. The teeth become richer in water but poorer in protoplasm.

Anything, therefore, which leads to consumption of protoplasm in the body, be it dropsy or consumption or pregnancy, must necessarily draw protoplasm from other tissues, where it is not absolutely needed. But the outside enemy has not got the consumption or pregnancy or anything of that kind. While, therefore, the system is weakening its fortifications, the enemy does not weaken, and, as a consequence, whenever there is a chance, that enemy will crowd in. If we see the forces of the attacking micro-organisms and those of the protoplasma within a tooth exactly balanced with a protoplasma of a strength, say of 20 per cent. of solid substance, and if by some disease the percentage has fallen to 10 per cent., the interior resistance has fallen to

one-half, and hence the increased liability to diseases by the relative change of forces. We do not enter into the still more remote detail of the How of the action of the protoplasm. We only wish to give our views about the "real handy" and often almost indispensable term, "vitality." Understood in this way, it seems to us to approach already somewhat nearer a clear conception than when it is used with the vague notion of a self-conscious entity, "vital force," something of a homunculus within the homo.

EDITORIAL.

DR. FRANK ABBOTT ON CARIES.

In the April number of the *Independent Practitioner* a very able paper of Dr. Frank Abbott, M. D., of New York, is published. The high standing of the author in the dental profession makes his paper of quite a special value. The paper of Dr. Stockwell, Etiology of Dental Caries; acids or germs, which? has produced something of a stir-up we might say all over the civilized dental world. We have read it in English and German journals, and several societies in America have made the paper a special study of their meetings, and our opinion is it deserves it. Also Dr. Abbott evidently thinks it of some momentous importance.

Facts, without being arranged in a certain logical manner, are no science, and structures made up of words, suppositions, guesses, hypotheses without the foundation of facts, are nothing but castles built on soap bubbles. The woeful state of theology with no real foundation proves the worthlessness of guesses without facts. It has been said against the paper of Dr. Stockwell that Dr. S. is no microscopist of a world-wide reputation himself. To compare small things with larger ones, we would say that Keppler, the great astronomer, equal to Newton, was an investigator who did not even have two suits of clothes paid for during all his life, and never had an instrument at his disposal, or if he had they were worthless for his purposes. Yet he established laws which have stood the most rigid test of centuries of investigation and calculation. Such men who are able to weigh evidences and out of evidences make a case, are just as much needed as those who hunt up the evidence. A little microscopy does not constitute a scientist. We do not wish to have the last remarks under-

stood as directed against Dr. Abbott; he has done more than a *little* microscopy, but there is many an amateur microscopist who thinks the world has to turn around his special instrument. One of the men who keeps the richest scientific shop is Dr. W. D. Miller, of Berlin, Germany, who during last year has made a great number of valuable investigations, and whose investigations possess so much greater value because he has had the assistance of one of the finest laboratories in the world.

Also Dr. Abbott evidently relishes a dish of his scientific kitchen. We feel flattered of course that Dr. Abbott also thought our investigations worth attention. It seems that many amateur theorists in the profession might be greatly benefited in their theories by keeping on their writing desks, printed in big type, the fact that a considerable number of analyses has shown that the lime-salts are present in the white friable mass generally found in advance of the common white decay. But how would the adherents of Dr. Watt fare with these facts? We do not wish to be considered conceited when we reiterate the results of these analyses: *The lime-salts in a tooth are not dissolved in advance of decay, they are there.* We don't wish to state they are there in the same state as in a healthy tooth, but they are there in the same chemical composition and the same proportion as in the healthy dentine. Dr. Abbott comes to the conclusion that the first impulse of decay "is under all circumstances due to the action of an acid which in a merely chemical way dissolves out the lime-salts from the enamel." Shall we accept it? Has not Dr. Abbott found many cases where there is but a mere speck of decay on the enamel, but where the whole enamel is undermined by large cavities of decayed dentine? Such cases are very common and in our opinion extremely illustrative. How could the acid bore through the enamel just one little hole, but underneath work such ravages? Dr. Abbott, it is true, finds the ultimate cause of the ravages in the irritation of the living matter by acids. That "acids are all very strong irritants of the living matter" we fail to make ourselves believe. We could cite almost any number of analogous cases where the supposed irritant effect of an acid on living matter does not exist. Then Dr. Abbott says irritation constantly applied will have in its course inflammation. Dr. Abbott speaks of this as if it was an entity, for he says, "after inflammation, swelling follows." Which of the two is the cause, the swelling or the inflammation? Inflammation could only be the cause, if inflammation was a something, but we think it is rather the reverse. The

swelling must precede before we can speak of inflammation. "This swelling of the living matter effects a *dislodgment* of the lime-salts." It is a good word! The little sentence, "In such cases the acid irritant formerly in the cavity is renewed," shows us that the devil is still there as bad as ever, only the house has been decorated and cleaned with brooms. (See gospel!) At the closing of this paper he asks a few questions, first: Why is it that the teeth of all persons do not decay the same? Well, Doctor, that is exactly the point under discussion. Do you think that it would be difficult to account for decay if all the teeth of all persons were decaying? If the teeth of all persons were decaying we would consider decay simply a physiological process, instituted by nature or God in a very providing and wise manner for dentists and parsons, for the first to live and the latter to talk unctuous nonsense about it. What we claim as the first cause is the congenital weakness of some parts of the enamel, which are born less strong than the other, and thus yield easier to the outer enemy, whatever it may be. The second question is that in ninety-nine cases out of one hundred, the lower front teeth, on which may be found the greatest number of organisms of any in the mouth, do not decay, while all others in the mouth do. How we would account for it? Well, Doctor, we might give you a column full of fine and beautiful logic, analogous reason, hypothesis, but as long as the microscopists in your profession have not yet made out what the ultimate structure of a tooth means, we shall confess, to our own shame, that we have to say we do not know. It might seem preposterous for us to answer questions three and four. We have attempted to answer them in many minor articles, not directly, perhaps, but from the train of reason there can be no doubt of what is meant, and we think some other defenders of the septic theory will be able to do better. As a general rule, a man favors the theory which seems to lie in his line of occupation. Appriori, one might think we should be delighted with Dr. Watt's chemical word-display—nascent, quiescent state, etc., what beauties!—since it would lie in our own line of occupation, but we are sorry to say that grossly chemical reactions seem to us to play only a subordinate part in the origin and growth of decay. Decay is a complex resultant, which seems to us to be made up of the following factors: First, a most preponderating influence of the congenital structure; secondly, a very important influence of live organisms of sepsis—germs; thirdly, a very small influence of the action of the acid or alkalies.

M.

KOCH'S BACILLUS AND ITS LESSONS.

The Therapeutic Gazette has a very interesting editorial on the above subject. He says: "It is true the existence of such a parasite has been quite strongly combatted by authority which commands respect, but a careful weighing of the evidence, *pro et con*, must, we think, satisfy the judicial mind that Koch has made out his case, and that the tubercle-bacillus is one of the facts of science."

. . . .

"Granted that the tubercle-bacillus is a fact, what are we to do with it? On the answer to this question rests the future treatment of consumption, prophylactic and curative, and the ingenuity of man will be directed both to the prevention of its entrance into the system and to its destruction in cases in which it has inadvertently, or in spite of prophylactic measures, found an entrance. When the means to these ends have been discovered, consumption will only occur as a result of negligence, and will prove fatal only as a result of improper or insufficient treatment. When these means shall have been discovered, medicine will have purged itself of the greatest of its approbia.

"Although the means of prophylaxis and cure, above referred to, are still veiled from our eyes (for we have faith in their existence), the discovery of the bacillus and its nature has already directed an intelligent treatment of consumption. It is fair to assume that it, like the germs of other diseases, is more or less constantly present in every community, floating about, as it were, seeking an opportunity to enter into systems in which it may propagate and work its mischief. It follows, then, that something more than the bacillus is necessary to produce consumption; it must have an appropriate soil. That soil, as is the soil in which other germs of disease take root and bring forth fruit, some thirty fold and some sixty fold and some an hundred fold, *is characterized by an absence of the power of vital resistance.* We know that the local lesion is by no means the first symptom of the affection which developes into full-blown tuberculosis. Preceding this there are dyspeptic disturbances, loss of appetite, emaciation, and a lowering of the vital forces. While these may not properly be a part of the consumption, they are what prepare the soil for the growth of the germ. It is fair to assume that the air-passages of those brought in contact with tuberculous patients frequently contain bacilli, *which, being met at the portals by the vital resistance furnished by the system in its average health*, fail to effect an entrance, degenerate, and are thrown off. It would follow, therefore, that *the main-*

tenance of the system at its full standard of vitality is the most effective prophylaxis against the ingress of the bacillus, which, when it gains admission, acts as a foreign body, and sets up the circumscribed inflammation which constitutes solidification, and which in turn breaking down, causes the tuberculous cavity.

"The discovery of the tubercle-bacillus antagonizes the theory of the hereditary nature of consumption, *per se.* While in very many instances the disease appears to run in families, it will hereafter be more correct to say that the *tendency* to it is hereditary, or, rather, that *the weakened power of resistance* to the entrance of bacillus is transmitted."

Change the words "bacillus" to germs or bacteria, "consumption and tuberculosis" to dental caries, and we have here a very good exposition of the germ theory of dental caries, together with the prophylaxis and cure of the same. The point on "vital resistance" of the tissues and general system is especially applicable and well stated.

MISSOURI DENTAL JOURNAL.

An editorial in the last *Missouri Dental Journal* announces that with this issue Dr. Spalding's connection therewith as editor and publisher ceases. "The publication office will now be removed to that active center of Western enterprise—Kansas City—and the future editorial guidance will be supplied from that city and its vicinity."

We are glad that the *Mo. Journal* is not to cease to exist, and trust that its change of climate will add to its vigor and enterprise. Many, however, will be sorry to have Dr. S. leave the editorial ranks, and will accord him their best wishes in his future plans and work.

WHAT IS THE "CAUSE?"

Will Dr. Catching be kind enough to demonstrate the "*cause*" that is assumed to produce the "*effect?*" The statement is often made that "*something*" precedes that which is termed "effect," but we are not informed just what it is. Don't suppose us any longer to be "weak enough to believe without thought or question," either the old or new.

A clear comprehension of the facts existing at the real line of conflict between the healthy and diseased tissue, as shown by the latest investigations, may possibly cause a falling "into line," and lead to a substitution of *assumed* "effect" for "cause."

CREMATION.

The subject of disposing of the last remains of the dead, by means of cremation, has seemed to be a little slumbering for the last few years. It seems to have reached a stage where the general public can no more be brought beyond it. It is rather an humiliating sight that in our century, boasting of so much enlightenment and independence of opinion, nothing but old fogyism and superstition should determine the course of events. Cremation is a question of vastly more every day importance than Mormonism, Baptism, Republicanism or Democracy. The amount of real heathenish and savage ceremonies, of all ways of mourning for the dead still practiced, shows no improvement upon those of the Chinese, or of the Hindoos, or Negroes thousands and thousands of years ago.

If one takes a walk in Boston and sees there, similar to a filthy Oriental city, in the center of most frequented thoroughfares, cemeteries with their uncouth, ugly gravestones and lying inscriptions praising some nobody who lived sometime ago, one must feel convinced of the truth of the theory of geologists and biologists, that it took thousands or perhaps millions of years for man to develop himself out of semi-apes.

The whole process of cremation, as compared with that of burial and rotting, has such an immense advantage that it would almost appear as an insult to any of our readers if we should attempt to draw their attention to any of them. We were present at a cremation in Dresden. The whole process was done in two and one-half hours, and what resulted was snow-white, clean and pure in every way. How does that compare with burial? After ten years, there still remain disgusting, offensive and repulsive masses which, even if they should have belonged to our most beloved ones, would never fail to fill us with the utmost aversion. It will take, of course, still many thousands of years, till people have come to the conclusion that a corpse represents some money value to the chemist; the ammonia which we could get out of it, the nitrogenous compounds, the illuminating gas, the glycerine, soap, etc., give to every corpse a value of at least $5.00 present money. If properly utilized, the corpses would rather become a source of income to a city than of immense expenditure. We personally should prefer exceedingly to be of some use after death, and not to laze a sleep of idleness in the filthy tomb, and we should be thankful to the man who would grind up our corpse for fertilizer. What a vastly higher idea of the fate of our corpses after death it is,

to be used for some progressive purpose, or to become a part of some plant, etc., rather than to be a source of disgust and a nuisance generally to every body, individuals as well as authorities.

Friends of progress, every where, do not relax your efforts in arousing people to think themselves rather than to accept without thinking, old notions and animalic conservatism. With conservatism, the world never would have advanced. If there is a spirit of evil and darkness in the world, it is the spirit of conservatism and ancestor-worship; if there is a spirit of good and light, it is that of progress, of free independent thinking, of reason. The nations who made mummies out of their dead have gone down to well-deserved annihilation.

WHAT WILL THEY DO?

The following is copied from the editorial columns of the *New England Medical Journal.* That it applies to the dental as well as the medical profession few can doubt who are conversant with the facts. But how are the "mills" which go on "grinding out" dental graduates by the hundreds, if not thousands, annually, to be "stopped?" Or how are they to be compelled to raise the standard of examinations at both ends of the course?

"At a low estimate, fifteen hundred students have been graduated at the different colleges through the country during the spring, and now arises the question, what will they do?

That the profession is now overstocked is apparent to any one who has made a most superficial examination of the matter. Every place is full to overflowing, and every year young men who were led to believe that the practice of medicine is the royal road to fortune and to fame, are from sheer excess of competition and crowding, forced to abandon the profession and seek some other mode of obtaining a livelihood, thus throwing away all the years of study and labor, on finding it unproductive.

Is it not a serious thing to lead these men to suppose that there is plenty of room and plenty of work when the profession is so full? What can ever repay them for the years of lost time studying for a profession in which there is little chance of gaining a livelihood, less of acquiring a fortune? The only remedy that seems to hold out any prospect of success is that it be made more difficult for them to graduate, by demanding preliminary examinations and a higher course of instruction, with proportionately difficult final examinations. But will

this ever be done? We fear not, so long as the medical colleges are owned by the faculties, and are dependent upon the number of students attending for their expenses and fees. One thing is certain: that the profession are alive to the fact that there are now more doctors than can obtain a decent living, and that something soon must be done to stop the mills that grind them out by the thousands annually."

MEETING OF THE SOUTHERN DENTAL ASSOCIATION.

The time of meeting has been changed to *Tuesday, July 31, 1883*. The meeting is to be held at Atlanta, Ga. We venture the assertion that if any Northern dentist feels disposed to attend that meeting of live Southern brethren he will be sure of a most cordial welcome. The change is made so as to accommodate any who may wish to attend the Southern and then go to the American at Niagara Falls. The Georgia State Dental Society also meets at Atlanta on July 30.

The State Board of Examiners of North Carolina would seem to have it in their power to provide that State, at least, with efficient dental practitioners, as the law provides that graduates, as well as non-graduates shall stand an examination before that Board. Missouri has also passed a law to regulate the practice of dentistry, New Hampshire and Vermont ditto. Massachusetts—well, her legislature and the code of ethics of the various dental societies within her borders make Massachusetts an easy prey to the "quacks" and "cheap Johns." The legislature ties the hands of the societies, and the societies in turn tie the hands of members by their code, and the above unprincipled rapidly growing class have a free course, and no effective obstacle thrown in their pathway.

Under "Societies" may be found the substance of the programme of the Union Meeting at Springfield, Mass., June 6, 7 and 8. Parties intending to be present may find it to their interest to note the arrangements for a reduction of railroad fare. A very large and interesting meeting is now certain.

Send us $1.00, with your name and address, for the N. E. Journal of Dentistry for seven months, commencing with the June number.

SELECTIONS.

BROMIDE OF ETHYL THE MOST PERFECT ANÆSTHETIC FOR SHORT, PAINFUL SURGICAL OPERATIONS.

BY JULIAN J. CHISOLM, M. D.,

Professor of Eye and Ear Diseases in the University of Maryland, Surgeon in Charge of the Presbyterian Eye and Ear Charity Hospital, Opthalmic Surgeon to the University Hospital, etc.

(Read before the Baltimore Academy of Medicine, December 5, 1882.)

[Reprint from the Maryland Medical Journal of Jan. 1, 1883.]

Three years since, when the Bromide of Ethyl was brought prominently forward as a substitute for chloroform by Dr. R. J. Levis and Dr. Laurence Turnbull, both of Philadelphia, I, with other surgeons, experimented with the new anæsthetic, with the intent of comparing its reputed advantages with the well-known agents, sulphuric ether and chloroform. I discarded it after a very short trial on account of its apparent inefficiency, and because of the very evanescent nature of the sleep induced by it. I found great difficulty in putting my patients to sleep; and when at last narcotised, they would suddenly recover consciousness at most awkward periods in the midst of eye operations, to my serious annoyance. In two cases, especially, in which I continued the inhalation from time to time as I would have done with chloroform, until upwards of an ounce of the bromide of ethyl was used, nausea and vomiting followed, which, in its severity and duration, I have rarely seen exceeded in the most sensitive of my chloroform patients. For twenty-four hours the sickness of stomach continued. The hospital ward in which the patients were lying had its atmosphere redolent with the garlicky odor of phosphorous, and the breath of these patients was offensive from the same smell on the day after the inhalation. For some months after this very unsatisfactory brief experience, my bromide of ethyl bottle remained corked. About this time great publicity was given to a death in the practice of Dr. Marion Sims, from ethyl administration, in which several ounces had been used, and the narcosis kept up for a long period. This was the first time that ethyl had been inhaled for anæsthetic purposes in New York city. This first fatal case was followed soon afterwards by a death under the use of ethyl in the practice of Dr. Levis, of Philadelphia. These two fatal cases put a very sudden stop to the use of bromide of ethyl in the United States.

Confiding in the statements of Drs. Levis and Turnbull, both of them surgeons of large experience, that the bromide of ethyl had good properties, I was still disposed to believe that the new and comparatively unknown anæsthetic possessed attributes which we had not succeeded in developing. I therefore again commenced experimenting cautiously with this new remedy. By degrees, as I became better acquainted with it, it secured my confidence. For the past year I have used it on an average at least once every day, often administering it four, five or six times, during the day's work in private practice and at the hospitals. Familiarity with its peculiarities and effects, and the discovery of the proper method of administering it, has taught me to value its advantages more and more highly, till now I consider it *par excellence the anæsthetic* to be used for any painful surgical operation which can be quickly performed. *Having found out how to use it, and what to expect from its administration, I can obtain the most brilliant results from it, and have become quite enthusiastic in its praises.*

In every patient, using the needful precaution, I have produced complete narcosis in less than one minute, often in from twenty to thirty seconds. A deep sleep which, however, will not last more than one or two minutes. From this speedily induced narcosis recovery is rapid and complete, with neither nausea nor heaviness, so that as a rule five minutes after the inhalation the patient is as much himself as if no anæsthetic had been used. Experience has taught me that these are the peculiarities of the bromide of ethyl when administered for anæsthetic purposes, and that as such they will prove of inestimable value to surgery.

The following very interesting cases, patients recently operated upon, will illustrate how thoroughly and speedily the brain resumes its full function after complete ethyl narcosis:

Miss M., a self-possessed little girl, eight years of age, desired to have an ugly squint corrected, and exhibited no timidity in witnessing the preparations needful for its performance. Prior to getting upon the table she had her collar loosened to remove any impediment to respiration. In doing so she took two roses from her dress and placed them on a vacant chair near by. She was then put on the operating table and the bromide of ethyl administered. A very few inspirations produced deep sleep, under which the tenotomy of the rectus muscle was performed. The ethylization and squint operation occupied fifty-six seconds: the time was taken by one of my assist-

ants. Within three minutes from the commencement of the narcotism the child was perfectly awake, and was ready to get from the table. When on the floor she walked at once to the chair, and within four minutes from the time that the anæsthesia was commenced she was engaged in pinning these roses into the front of her dress, with a composure which showed not only no present discomfort, but a complete oblivion of the experience through which she had just passed.

The second case, also one of convergent squint, was that of a boy, fifteen years of age, who seemed very anxious to get rid of his deformity. After getting on the operating table, before the medical class at the University of Maryland clinic, I told him that when the towel was placed over his face it would have a very choking sensation, but that he could not choke from it. I also showed him how to take quick and full inspirations, so that the suffocative sensations would entirely pass away before he had breathed a half dozen times. When the folded towel, upon which a drachm of ethyl had been poured, was placed over his face, he commenced a most active respiratory movement, which in a very few seconds quieted down into deep sleep. Within thirty seconds from the commencement of ethylization, narcotism was profound. The operation was commenced without delay, and the division of the tendon speedily consummated. The entire operation from the commencing ethylization to the perfection of the tenotomy did not exceed sixty seconds. A minute had not elapsed from the completion of the operation when he awoke, and jumping from the table to the floor of the amphitheatre, he cried out in a jubilant voice, "I am all right," much to the amusement of the medical class who had crowded the benches: a very different behavior from that which follows the inhalation of chloroform or ether. In this case the entire period, from the beginning of the inhalation, through the stage of complete narcosis, to perfect restoration, did not exceed two minutes.

A *third case* was that of a gentleman of extremely nervous temperament, who was disfigured by a tarsal tumor. On account of his dread of being operated upon, he had carried this ugly swelling on his lid for over a year. One Sunday morning he presented himself at my office with the request that I would operate upon him at once, making as a condition that I would give him chloroform. It is an established rule with me never to administer an anæsthetic without an assistant being present. Having explained the necessity for this course, I requested him to meet me at the University Hospital within

an hour, so that I could secure the presence and aid of the resident physician as my assistant. I anticipated his arrival and had everything prepared for his coming. I received him on entering the vestibule of the hospital and accompanied him at once to the amphitheatre. With no loss of time he got upon the table and was told to take full inspirations of the medicated vapor in spite of the suffocative feeling excited by the ethyl. As soon as the cone containing a drachm of bromide of ethyl was placed over his nose and mouth, he commenced a series of slow, deep inspirations, which terminated in full narcosis by the time the eighth inspiration was taken. His breathing was free, pulse strong, color of face bright, with the appearance in every respect of ordinary, deep, natural sleep. Desmarres' ring forceps or clamp soon secured the lid, the tumor was freely opened from the conjunctival surface, and by means of a cutting spoon the epithelial lining of the cyst was speedily scraped off. A few rapid rotations of the spoon effected this very promptly. This manipulation was a matter of a very few seconds. The awakening was equally prompt. Within two minutes from the time he laid upon the table he was standing on the floor. Upon being questioned, he said that he was perfectly himself, and had felt nothing whatever of the operation. He asked whether all was over, and when assured of it, he put on his hat and walked out of the room. Within six minutes from the time of his arrival he was again passing out of the entrance door of the hospital into the street, having, during this very short period, been ethylized, operated upon, and resumed his natural condition of feeling.

I might go on enumerating case after case, until my entire experience with the wonderful efficacy of ethyl, in all cases of what I now call primary anæsthesia, was gone through with, covering at this time over 400 inhalations. These three cases, however, will suffice to show how thoroughly the brain recovers its perfect functions after the deep but very transient impression brought about through the inhalation of the vapor of this potent agent. Persons who, only three minutes before, had been in such deep sleep that they were insensible to pain, now walking out of the operating room with a firm tread and with a clear brain.

On account of its activity, efficiency, and the evanescent nature of its narcotic effects, the bromide of ethyl has become my favorite anæsthetic for all surgical cases, in which, by quick manipulation, I can perfect a painful operation in a short period.

Experience, by daily administration, has taught me this very valua-

ble lesson, viz., that the Bromide of Ethyl is not an anæsthetic which can be advantageously repeated or its inhalation be continued for any length of time. This is one of the serious mistakes which we made in our early experiments and which induced me, through ignorance, to discard the new agent as unreliable.

Its wonderful action is obtained during the first minute of its inhalation and what I have called its primary anæsthesia.

In cases, in which from some interference with the rapidity of the manual of operative procedure this primary anæsthesia wears off, and a second, and even more numerous administrations have to be made to keep up the anæsthetic state until the operation can be completed, while the narcosis can at all times be reproduced, nausea is very apt to follow. By this frequent repetition of the inhalation, a mental depression is established, as from the continued use of chloroform or ether, which may last many hours.

Fortunately there are many surgical operations of a very painful nature which can be perfected within the short period of a primary ethyl narcosis. Abscesses can be lanced, cysts emptied, sinuses laid open, wounds probed, strictures incised, muscles divided, ingrowing nails removed, surfaces cauterized, examinations made necessitating painful manipulations, and even amputations may be performed. It must not be forgotten that prior to the discovery of anæsthetics, Mr. Liston urged the general adoption of flap amputations, because all painful cutting, including the sawing of the bones, could be completed in so many seconds and did not require minutes at the hands of dextrous surgeons.

In Eye and Ear Surgery, in which I am now exclusively interested, the irritable eyes of children can be carefully and thoroughly examined, tumors can be removed from the lids, abscesses punctured, orbital sinuses explored, the lachrymal canals laid open, the nasal ducts probed, foreign bodies removed from the cornea, canthotomy practiced, crossed eyes straightened, the operation for artificial pupil perfected, ingrowing lashes destroyed by the cautery, needle operations for soft or capsular cataracts effected, and even optico-ciliary neurotomy completed. All such operations I perform now under a primary ethylization, if the patient exhibits any timidity or expresses a desire to be put to sleep. Cataract extractions, enucleations and many lid operations require more time for their safe performance than ethyl narcosis permits. If every preparation be made in advance, instruments arranged in the order in which they are to be used, and

placed within easy reach, and if the surgeon is able to manipulate with dexterity, it can be readily seen that a very large part of the painful procedures of surgical practice might be made altogether painless by taking advantage of the wonderful nature of ethyl narcosis.

In Eye Surgery I not only use ethyl daily, but if deprived of it would feel that I had lost one of my very best assistants.

What can be more satisfactory than the correction of that ugly deformity, squint, under the perfectly quieting influence of the bromide of ethyl, in less than one minute, to cover ethylization and the tenotomy? In fifty-two seconds, as measured by the stop-watch, I have ethylized the patient and completed the division of the faulty muscle. The patient, quite himself in two minutes more, finds the ugly deformity gone, and without the slightest knowledge, on his part, of how the wonderful transformation has been brought about. This was my most expeditious operation. In the presence of the large medical class of the University of Maryland I have repeatedly completed the entire operation for the correction of squint, including the whole time necessary for the administration of the anæsthetic, in less than sixty seconds, as measured by the stop-watch.

To use the bromide of ethyl effectually, one must have confidence in himself and also in the safety of the agent which he is administering.

For long operations, or such as I desire to complete slowly, I prefer to administer chloroform, an anæsthetic with which I have had long, extensive and uninterruptedly satisfactory experience. *Of over 12,000 patients, upon whom I have operated under the narcotic effects of chloroform, I have not lost one.* These patients cover organic disorders of heart, lungs, kidney or visceral disease, in persons of all ages, from the child only a few days old to my oldest chloroform administration, a very old man of ninety-six. Some were strong while others were very feeble. I never refuse the comforts of an anæsthetic to any person upon whom I have to operate.

Chloroform has always served me so faithfully that I have never had any good reason for transferring my allegiance to sulphuric ether. I now and then use ether, but only at long intervals. Should a patient express any positive objection to chloroform, and desire that ether be administered in his case, I always carry out his wishes. When the selection of the anæsthetic is left to me, and it usually is, my preference is decidedly for chloroform. I use chloroform so freely that I buy it literally by the gallon or in seven-pound bottles, many of which I have emptied. Of sulphuric ether I still have a

pound bottle, which has been in my possession already five years, with contents not yet consumed. I believe that sulphuric ether is as safe as chloroform, but not more so. I know it to be more disagreeable in its odor and much more unpleasant in its inhalation. I believe that either chloroform or ether, when carefully given in accordance with well-known laws, which should always be observed in the inhalation of anæsthetics, will with few very rare exceptions carry safety in its train. I also believe that if proper care be not taken, trouble may come to both patient and surgeon regardless of the agent selected. Some physicians have much more anxiety while using anæsthetics than others, not because they have a worse class of patients, but because they have never acquired the necessary confidence in the article they use, nor do they feel the necessity, under conviction, of always having and observing fixed rules for their guidance in the use of these powerful agents.

After an experience of thirty years of an active surgical practice, I still hold chloroform to be the best of anæsthetics for tedious operations, provided certain simple rules are adhered to in its administration. I can enumerate them in a very few words :

1. I always, *without a single exception*, give a strong drink of whiskey, from one to two ounces, to every adult to whom I intend to administer chloroform. This is done a few minutes before they get on the operating table. Because I never omit this fundamental law, and in advance sustain the heart against the depressing effects of the anæsthetics, in not one of my 12,000 cases have I ever had to use, in a single instance, a hypodermic of whiskey. It is already in the stomach should it be needed, and can do no harm if not required.

2. Always loose the neck and chest clothing so as to have no impediment to respiration.

3. Only administer chloroform in the recumbent posture with body perfectly horizontal and head on a low pillow, this pillow to be removed as the anæsthesia progresses.

4. Give chloroform on a thin towel folded in conical form with open apex, so that the vapor, before inhalation, will be freely diluted with atmospheric air. In holding this cone over the face of the patient at some little distance from the nose, place the fingers under the borders of the cone for the double purpose of allowing air to enter freely, and also to prevent the chloroform liquid on the towel from coming in contact with the skin of the patient's face, and thereby avoid its blistering effects.

5. Should loud snoring occur, force up the chin. This manipulation, by straightening the air passages from the nose to the larynx, makes easy breathing. The forcible elevation of the chin is far better in every respect than pulling out the tongue. It is easier of application, more quickly done, requires no instruments, and is much more efficient in removing the impediment to respiration.

By always following these five simple rules I have had, so far, both safety and comfort in the administration of chloroform.

Possibly one very strong reason why I have been so successful in the administration of chloroform is, that as a specialist in eye surgery, the inhaler must be removed from the nose before I commence the surgical manipulations. Besides, while operating, I have constantly in view both the color of the face and the respiration of the patient, which I consider even more important for the surgeon to observe than to feel the pulse. When surgeons are operating on distant parts of the body and cannot watch the work of the administrator of chloroform, accidents are most apt to happen.

In the inhalation of the bromide of ethyl all of these rules laid down for the establishing of chloroform narcosis are not necessary, and some of them cannot be followed out.

The recumbent posture I consider essential for the safe administration of any anæsthetic, whether it be chloroform, ether or ethyl; hence, these agents are not safe remedies at the hands of dentists, who place their patients in a sitting posture. Preparatory to the inhalation of the bromide of ethyl I have not found it necessary to give whiskey. The only precaution I take is to loose the neck clothing and have the patient lie down with the head only slightly elevated.

My experiments have taught me that the mode of administering the ethyl should differ totally from that used in giving chloroform.

Instead of a chloroform vapor freely diluted with atmospheric air, a saturated ethyl vapor must be inhaled, to the exclusion of atmospheric air, in order to obtain speedily and effectually narcosis.

In my early experiments with this new agent I had not yet discovered this fundamental principle, and hence did not obtain good results. I voted bromide of ethyl a failure because, in common with other experimenters, I was too timid, or rather I should say, too ignorant of its peculiarities, to push the ethyl vapor in the concentrated form, which I have since found necessary to obtain good results. By my present method of administering it, I can obtain perfect ethylization in patients in from twenty to sixty seconds, and have no after consequences of nausea or dullness of feeling.

The best inhaler for the giving of the bromide of ethyl is a thick towel folded into the form of a small cone with closed apex. Between one of the folds of the towel I place a sheet of paper, which makes the cone nearly air tight. The base of the cone must be wide enough to enclose both mouth and nose. The soft material of which the inhaler is made enables the rim to be kept firmly in contact with the face, so as to exclude air from entering. I always instruct the patient how to make long inspirations, and inform him that he must do this, notwithstanding the fact that he will feel somewhat stifled. I also try to give him confidence by assuring him that a very few inspirations will put him to sleep. Usually I make him go through the process of strong respiratory movements in advance, so that he will know exactly how to proceed. Into this towel cone I pour about one drachm of the bromide of ethyl, and immediately invert the inhaler over the nose and mouth of the patient, holding its edge down firmly over the face. There is no fear of creating asphyxia, as all air can not be excluded, and the height of the cone makes a considerable air chamber into which the patient breathes.

Children usually struggle to escape from the apparatus. *The cone, however, must not be removed from the face for an instant until anæsthesia is produced.* At first some patients will resist the breathing of the vapor, but there is no fear that they will not catch their breath in time. Should children cry, it only insures inspiratory efforts, which the more surely and quickly will bring about the introduction of the vapor into the lungs. As a rule, a dozen full inspirations are all that are needed to produce deep narcosis. I recognize this desirable condition by a stoppage of all struggling. I have had deep sleep brought on by the sixth inspiration, when complete relaxation ensues, with quiet breathing, and an absence of reflex irritation should the conjunctiva be touched. The patient retains the usual healthy color of lips and cheeks as if in ordinary sleep, and the pulse becomes slower and stronger as the narcosis becomes profound. Thirty seconds, as a rule, is sufficient to bring about this desirable condition, and have the patient ready for operation.

I have not found this anæsthetic sleep last more than two or three minutes, often not so long.

Usually the patients awake suddenly and as completely as they would do from ordinary sleep. They are able to get down from the operating table without assistance and walk off without staggering, and with brain clear to answer correctly any question : in fact, quite themselves.

It took me some time to acquire such confidence in the safety of the remedy as to apply it in the concentrated form needful to obtain its fullest benefits. To the uninitiated it looks like cruel work to keep the cone of a saturated ethylized vapor over the face of a struggling patient. *I am convinced, however, that in no other way can quick, complete and safe anæsthesia be obtained by it.* Fortunately, the struggling is very soon over, and quiet sleep speedily ensues.

My experience with the bromide of ethyl will now exceed 400 cases, of which upwards of 300 are within the past year. I am beginning to be familiar with its administration and its effects. *I now know what is to be obtained by it, and what not to expect from it.* I give it without hesitation, in any case, to avoid painful manipulation. I have used it as often as six times a day, and I administer it, on an average, certainly once every day. In the last week I have given it fifteen times. For office use I find it invaluable, on account of its promptness, efficiency, evanescent nature of the anæsthesia induced, the absence of nausea, and the perfect comfort with which patients operated upon can leave my office within a few minutes after the ethylization. Its use in my every-day experience does not interfere with the routine of office practice, nor occupy more time than I give to an ordinary office consultation, a very important desideratum to those who have restless patients awaiting their turn in the reception room.

Those who will use it by a single inhalation, to produce a short, deep sleep, and not resort to a mal-administration of this very valuable, powerful agent for a continued anæsthesia, which it is incapable of sustaining in safety and in comfort, will become as enthusiastic as I am over its brilliant results. They will in time learn to consider it, as I do, the most perfect of anæsthetic agents for quick, painful surgical work. It can never take the place of chloroform or sulphuric ether where any heavy operations are to be done. These well-known and tried anæsthetics must continue in favor for all tedious operations, and will be used in minor surgery by those who manipulate slowly and do not have prompt, quick assistants. But when one can take advantage of a primary anæsthesia from the first administration of the bromide of ethyl, and having made every preparation in advance, will manipulate quickly, the new anæsthetic leaves nothing to be desired.

I will repeat, "can anything be more brilliant in surgery than a successful operation for squint, where an ugly deformity of years' standing is promptly, thoroughly, safely and surely removed in less than one minute of time—fifty-two seconds for ethylization and operation?" This is the nearest approach to magic in the art of surgery.

Books and Pamphlets.

FIFTH ANNUAL REPORT OF THE BOARD OF HEALTH OF THE STATE OF CONNECTICUT.

[Edited by C. W. Chamberlain, M. D., of Hartford, Secretary of the Board.]

This valuable contribution to the literature of sanitary science presents on its four hundred and fifty-six handsomely printed pages besides an abundance of material of importance to the physician and those interested in science generally, much that is of especial value to the dental practitioner. The work contains the general report of the Board for the fiscal year ending November 30, 1882, report of the Secretary and Treasurer, and some thirteen original papers by men of ability, a number finely illustrated by numerous wood cuts and plates. The paper entitled Epidemic Intermittent Fever, by G. H. Wilson, M. D., is accompanied by a large drainage map of Connecticut with isochronal lines showing the annual progress by towns of malarial disease through the State. The last one hundred and twenty-eight pages are occupied by registration reports of the Bureau of Vital Statistics, presenting many interesting features, as well as showing at a glance that the Secretary of the Board of Health is *not* an officer whose only duty consists in drawing his salary. Taken as a whole, the report is of great value, and we think the best that has yet been issued. We congratulate those who are so fortunate as to possess a copy.

Dr. Dennis in his paper entitled "Hatting as affecting the Health of Operatives," adds one more to the list of trades injurious to health. It seems that hatters are particularly prone to mercurial poisoning, and according to a paper read before the New Jersey Medical Society in 1860 one hundred cases had occurred in the town of Orange alone. The symptoms were "swelling and ulceration of the gums, loosening of the teeth, fetor of the breath, abnormal flow of the saliva, tremors of the upper extremities, or a shaking palsy and frequently some febrile action." "These cases recovered under the usual remedies for mercurial salivation, especially iodide of potassium, or without any treatment if the work was abandoned for a time. This disease occurred exclusively among the hat finishers, and, the presence of mercury having been established by chemical tests in the hat bodies before going through the process of finishing, it seemed clear that the hot iron volatilized the mercury, and the close, ill-ventilated rooms favored the absorption of it in the system, and so the workmen were poisoned.

The greater prevalence than usual of the disease at that time was found to be due to the use of a larger amount of mercury in order to render poor materials fit to work up into hats." . . . . . . "The preparation of the fur for hatting is called 'carroting' and the chemicals are called 'carrot' from the fact that their action on the hair colors it yellow like the vegetable of the same name. A mixture is made consisting of one pound of quicksilver, three pounds of nitric acid, and thirteen pounds of water; this is stirred with heat until the quicksilver is entirely dissolved, thus forming a strong solution of nitrate of mercury." . . . . . . "For years in the shops of Great Britain 'carroting' was done with a mixture of one pint of nitric acid and four parts of vinegar, and the felting was aided by mixing with fur a certain proportion of Saxony and Spanish lamb's wool. Consequently the workmen were entirely free from mercurial diseases."

"How can we Escape Insanity," by Chas. W. Page, M. D., Assistant Physician, Retreat for the Insane, Hartford, is a well-written essay showing careful study of the subject under consideration. As we are in hopes of making extracts from the paper for this *Journal* at an early date we will simply remark here that should we be called upon to prepare an article on the predisposing cause of dental caries we could find most of the material needed in this one paper. It is worthy of careful perusal.

Now that the germ theory of disease is being looked into so thoroughly by some in our profession as a factor in dental caries and other oral diseases, the following papers will be found interesting and instructive: "Microscopical Examination of Potable Waters in the State of Connecticut," by Wm. J. Lewis, M. D.; "Milk as a Medium for the Transmission of Disease;" "Some of the Organic Impurities of Drinking Water;" "Impure Ice," by C. W. Chamberlain, M. D., and "Protective Inoculation," by Noah Cressy, M. D., V. S. In these papers one can revel and become "hail-fellow-well-met" with such lively boys as *Cyclops Quadricornis*, *Canthocamptus Minutus*, etc., besides making the acquaintance of the five germ families, *Micrococcus*, *Bacterium*, *Bacillus*, *Vibrio*, and *Spirillum*.

There seems to be an increase of interest in all matters relating to health and sanitary science, but the limited space at our disposal will not permit of a more extended reference to the valuable matter contained in the report. G. L. P.

NOTES ON OPERATIVE DENTISTRY. By Marshall H. Webb, D. D. S. The S. S. White Dental Manufacturing Company, Philadelphia.

Soon after the death of the lamented Dr. Webb, the announcement was made that the above company had in press, and would soon issue, a work on Operative Dentistry by Dr. Webb, prepared during his long sickness, and completed just previous to his death. This work now appears, and will be hailed with both pleasure and sadness—with pleasure because, though dead, he once again speaks in this his last work; with sadness, because of the renewed remembrance that this must remain his last work.

Coming as it does just as we go to press, we cannot now attempt a review. We simply wish to call attention to its issue. It is a neatly printed and bound volume of 175 pages, profusely illustrated, descriptive of the methods in detail of treating and operating practiced by the author, giving "those only which have proved to be—not the easiest but—the very best."

Not the least attractive feature of the book is a most excellent frontispiece of the well-known face of the author.

The table of contents is as follows: "Histology," "The Deciduous Teeth," "Prevention of Irregularity and Decay," "Application of the Rubber Dam," "Preparation of Filling Materials," "The Mallet," "Filling Cavities in Masticating Surfaces," "Filling Cavities within Labial and Buccal Walls," "Pieces of Porcelain for Filling Cavities of Decay," "Filling Cavities within Approximal Walls," "Preparation of Cavities for Restoration of Contour," "Restoration of Contour and Prevention of Extension of Decay," "Summary of Principles Relating to Filling Teeth," "Covering and Protecting Frail Walls of Enamel with Gold," "Placing Crowns on Roots of Teeth," "Attaching Crowns to Teeth where Roots are Missing," "Irritation and Death of the Pulp," "Filling Pulp Chambers," "Treatment of Abscess," "Pericementitis" and "Necrosis."

The world-wide reputation of Dr. Webb as an operator will ensure for his "Notes" on the above subjects a large and rapid sale.

We have received the February number of Die Vierteljahresschrift des Vereins deutcher Zahnkünstler, edited by August Polcher of Dresden. Office Dresden an Markt 3 & 4. It is a very rich number, full of practical as well as theoretical suggestions and papers. We are indebted to the Journal for some of our selections.

Cranial Nerves—William O. Thrailkill, M. D., D. D. S., Oakland, California. This is a chart giving the names, place of origin, foramen of exit, principal distribution and function of each of the cranial nerves. A good thing to frame and hang in one's office. Price 56 cents.

Bromide of Ethyl, the Most Perfect Anæsthetic for Short, Painful Surgical Operations, by Prof. Julian J. Chisholm. We consider this paper so good that we give it in full in this number.

First Annual Announcement of the Collegiate Department of the Chicago Dental Infirmary.

The Fourth Annual Report of the Massachusetts State Board of Health, etc.

Annual Catalogue of the Dental Department of the University of Maryland.

The Fifth Annual Report of the Connecticut State Board of Health.

A Directory of the Dentists Practicing in the State of Georgia.

Transactions of the Illinois State Dental Society for 1882.

SOCIETIES.

UNION DENTAL CONVENTION.

The Massachusetts and Connecticut Valley Dental Societies will hold a three days Union Convention in Gill's Hall, Springfield, Mass., June 6, 7 and 8, 1883.

ORDER OF EXERCISES.

Executive and Section Committees will meet promptly at 10.30 Wednesday morning, to perfect and determine the order in which the programme shall be taken up.

Routine business meetings of the two Societies in the ante-rooms of the hall at 11 o'clock, A. M.

The joint convention will be called to order by Dr. F. Searle, President of the Mass. Dental Society, at 2 o'clock, P. M.

SECTION 1. Anatomy, Physiology, Histology and Microscopy.
Dr. S. E. DAVENPORT, New York, Chairman.

Paper—Recent Developments in Microscopy.
By Dr. R. R. ANDREWS, Cambridge.

SECTION 2. Pathology, Therapeutics, Etiology and Diagnosis.
Dr. C. T. STOCKWELL, Springfield, Chairman.

Paper—The experiments, observations and conclusions of Dr. W. D. MILLER, of Berlin, Germany, concerning Dental Caries, to be illustrated by drawings, diagrams and microscopic sections.
By Dr. W. C. BARRETT, Buffalo, N. Y.

Paper—Needed foundations for theories in dentistry.
By Prof. CHAS. MAYR, Springfield.

SECTION 3. Chemistry, Materia Medica and Anæsthetics.
Dr. E. S. NILES, Boston, Chairman.

Paper—Chemistry of Decay. By Dr. E. S. NILES, Boston.

Paper—Amalgams. By Dr. T. H. CHANDLER, Boston.

SECTION 4. Surgical and Operative Dentistry, Education and Literature. Dr. L. D. SHEPARD, Boston, Chairman.

Clinic—Bonwill Crowns. By Dr. W. G. A. BONWILL, Philadelphia.

Clinic—Buttner Crowns. By Dr. H. W. F. BUTTNER, New York.

Clinic—Brown's method of setting crowns.
By Dr. E. PARMELY BROWN, Flushing, N. Y.

Clinic—Crowns. By Dr. A. H. BAKER, Boston.

Paper—Fisk Caps and method of application.
By Dr. H. C. MERIAM, Salem.

SECTION 5. Mechanical Dentistry and Metallurgy.
Dr. C. F. BLIVEN, Worcester, Chairman.

Clinic—Method of taking impressions of Roots, and improvements in gold attachments. By Dr. H. A. BAKER, Boston.

Paper—New instruments and ways of making them.
By Dr. C. F. BLIVEN, Worcester.

There will be papers by Dr. BONWILL, and other eminent men, the subjects of which we cannot now announce.

The Executive Committees have such assurances from all sections, that they are preparing for the largest gathering of the Dental Profession ever held in New England.

The Connecticut River, Vermont Central, and New York and New England Railroads (except from Hartford), will give return Checks to all attending the Convention. The Boston and Albany Road will sell round trip tickets at Boston for $3.90, at Framingham, $3.10, at Worcester, $2.20, at Pittsfield, $2.20.

Hotel Charges. Hotel Warwick, $2.00 per day; Haynes House, $2.50; the Massasoit, $3.00.

The Executive Committees wish those who may have specimens or models of cases in practice, instruments, materials or new appliances, or papers not already announced, or any subject or matter to bring before the Convention, would notify them at as early an hour on Wednesday as possible.

D. F. WHITTEN, S. B. BARTHOLOMEW, } *Chairmen of Ex. Committees.*
W. E. PAGE, Boston, *Secretary M. D. S.*
A. ROSS, Chicopee, *Secretary C. V. D. S.*

NEW YORK DENTAL SOCIETY.

At the annual meeting of the Dental Society of the State of New York, held in Albany May 9 and 10, the following officers for the current year were elected, viz.:

President—Dr. L. S. Straw, of Newburgh.
Vice-President—Dr. Wm. Jarvie, Jr., of Brooklyn.
Secretary—Dr. J. Edward Line, of Rochester.
Treasurer—Dr. H. G. Mirick, of Brooklyn.
Correspondent—Dr. W. H. Atkinson, of New York.
Censors—Drs. N. W. Kingsley, of New York; Wm. Jarvie, Jr., of Brooklyn; S. D. French, of Troy; W. H. Colegrove, Johnstown; S. B. Palmer, of Syracuse; A. M. Holmes, of Morrisville; F. French, of Rochester, and A. P. Southwick, of Buffalo.

The President announced the following Committees:

Arrangements—Drs. Wm. F. Winne, Albany; E. C. Butler, Albany; H. A. Hall, Troy.

Publication—J. Edward Line, Rochester; F. French, Rochester; C. Barnes, Syracuse.

The remaining Committees will be transmitted to the Secretary when made.

NEW HAMPSHIRE DENTAL SOCIETY.

The sixth annual meeting of the New Hampshire Dental Society will be held at Phenix Hotel, Concord, Tuesday, June 19, 1883, at 11 o'clock, A. M., continuing during day and evening.

The Board of Censors will meet for the examination of candidates for licenses at Phenix Hotel, Monday evening, June 18, at 7.30 o'clock.

Dentists of the State are cordially invited to be present at the meeting.

R. R. fare, half-rate.

E. B. DAVIS, *Secretary*, Concord.

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ORIGINAL COMMUNICATIONS.

THE FORMATION OF THE MATRIX OF DENTINE: OF THE SHEATHES OF NEWMAN, AND THE FIBRIL OF TOMES.

BY R. R. ANDREWS, D. D. S., CAMBRIDGE, MASS.

[Read before the Massachusetts and Connecticut Valley Dental Societies, at Springfield, Mass., June 6, 1883.]

Gentlemen: At the request of the Chairman of the Section on Histology, I have devoted the little time that could be spared from a very busy professional season to the reproduction of a paper which I supposed I had, but which I find has been destroyed. I shall not attempt any elaborate treatise, but will give you a few histological points as I see them under the microscope. Six years ago I had the honor to read a paper on this subject before the Boston Microscopical Society (since merged into the Society of Natural History). The conclusions reached at that time, although differing from the theories of the accepted authorities, have to my mind been repeatedly verified by my more recent investigations. A subject of this kind requires the most careful observation, and before presenting that article I devoted a large portion of my leisure moments for a period of two years and over to actual research—making large numbers of specimens fresh from embryos, at about the time of birth, from which I obtained my facts.

Let us consider the form of the dentine germ. At first it is nothing more than a part of the sub-mucous tissue of the jaw, which becomes more rich in vessels and cells than the neighboring parts. It does not present any structure essentially different from that found around it. It speedily assumes the form of the apex of the crown of the future tooth; if a canine, simply conical; if a bicuspid, two cusps, etc. The cells forming its surface become differentiated from the parts beneath it, becoming much larger than the embryonic cells of the germ itself; they are longer than they are broad, and are called odontoblasts or dentine forming cells. They are now ready for the process of calcification. By this description I shall more clearly present to you the views of the generally acknowledged authorities of the present day.

I take it for granted that we are all acquainted with the appearance of formed dentine, with its matrix or basis substance, tubes, sheathes and fibrils. Kölliker, in an article on the development of teeth, in 1868, speaking of these odontoblasts, believes that while the canals and their contents are continuations of them, the matrix is a secretion from the cells, or from the rest of the pulp, and so is an intercellular substance. He believes that a single cell is sufficient to form the whole length of a dental fiber, but in a later edition speaks with some hesitation on this point. Tomes, in his Dental Anatomy, speaking of the odontoblasts, says: "The most external portion of each cell undergoes a metamorphosis into a gelatinous matrix, which is the seat of calcification, while the most central portion remains soft and unaltered as the fibril." Intermediate between the central permanently soft fibril and the general calcified matrix, is that portion which immediately surrounds the fibril, viz: the dentinal sheathe. Thus we have the dentinal fibril in its soft condition little more than the unaltered protoplasm of the cell; the dentinal sheathe, one of those peculiarly resistant substances which is on the border land of calcification; and, lastly, the matrix, a completely calcified tissue.

Waldeyer, in Stricker's Manual of Histology, in describing the development of dentine, says: "The external layer of the germ is formed by a layer of large cells of elongated form, *provided with numerous processes*, called odontoblasts, which are arranged so as to form a kind of columnar epithelium. They are finely granular and destitute of any membrane. The ovoid nucleus is generally contained in that end which is turned toward the pulp. Three kinds of processes may be distinguished in these cells: the dentinal, pulp, and lateral pro-

cesses. The dentinal processes constitute the above described dentine fibers; it need only be here repeated that from one cell several dentine fibers are frequently given off (Boll counted as many as six). Such odontoblasts with such processes are broad at the end directed toward the dentine; but, as the processes pass on, they gradually diminish to form dentinal fibers. The odontoblasts are intimately connected with each other by means of the lateral processes. The short pulp process usually springs from the cell with a moderately broad base, and is constantly connected with one of the cells lying immediately beneath the odontoblast layer." He also believes with Tomes that only the outer portion of the cells calcifies, while the protoplasm of the inner portion forms the dentine process. Wedl remarks, describing the part the odontoblast plays, "The mode of development of the dentine is so far determined that we know positively that the dentine is developed from the dentinal cells. We may also readily demonstrate that as soon as the connection of the dentinal with their formative cells occurs, the calcification of the contents of the dentinal cells begins. That their principal and accessory processes remain attached, and are transformed into dentinal fibers; and that a constant deposition of calcareous salts into the cells takes place from the blood. By the continuous transformation of formative cells into dentinal cells, the process goes on, and new layers of dentine are deposited constantly by progressive calcification."

After thus briefly presenting these statements in a manner I have tried to make plain, I will describe my method of preparing specimens, and then the conclusions I have reached from my own observations. Having found it difficult to obtain fresh human embryos from which to work, I have made my sections from the embryos of pigs, as the processes of development are nearly identical. For these embryos I am greatly indebted to Mr. John P. Squires, of East Cambridge, from whose packing establishment many of the histologists of Boston have been supplied. I first decapitate the embryo, and drop the head into a solution of chromic acid (about one-third of one per cent.) to decalcify it. After from one to three weeks' time, during which the mixture is now and then stirred, I take the heads and wash them in distilled water; then place for twelve hours in a thick solution of gum arabic. It is then transferred to a mixture of alcohol with about one-sixth its volume of water. After a few hours, the gum which has penetrated into the substance of the tissue will be hardened throughout, and the mass can then be cut into such pieces as you wish. The

embedding material is made by taking two-thirds paraffine with one-third lard. This is melted together and poured into some convenient mould, which may be made of paper. While this is still hot, but cloudy from the process of cooling, the piece of tissue selected is placed in it in such position as you may wish in making your section, and allowed to cool. Sections can then be cut across the whole with a suitably sharpened razor, or some of the more valuable instruments for this purpose,—the microtome or section cutter. The cut sections are then to be placed in distilled water for a half hour to soak out the gum, and then stained in alum carmine. I cannot speak too highly of this preparation of carmine for staining embryonic tissue. It is far superior to any of the other stains that I have used, and I have used a great many. I am indebted for it to my friend, Dr. S. E. Wyman, of Cambridge, who obtained the recipe while in the laboratory of Prof. J. Arnold, of Heidelberg, Germany. As given by Prof. Arnold, "take about one gramme of carmine in fifty cubic centimeters of a solution of alum of the strength of from one to five per cent. (best about five per cent). Cook it fifteen minutes (boiling), filter, and then add a little thymic acid (a few crystals)."

I then take the sections I find to be worth saving and place them in this stain for twenty-four hours. Then I wash them quickly in distilled water, place them in absolute alcohol for two minutes, and then in oil of cloves for another two minutes to clarify. They are now ready to mount on a glass slide in Canada balsam and cover with a thin glass cover. A preparation of balsam in benzole is the kind I prefer; it is very handy to use. Valuable specimens for study are made without staining. We must bear in mind that a section which shows its structure with the least possible manipulation is the one to be relied upon. We must avoid shrinking the tissue by the repeated use of reagents, especially alcohol. I cannot urge this point too strongly. I mount many specimens in glycerine and water rather than use alcohol at all, and even with this you have to use care.

Under the microscope, looking at a section cut across the enamel organ, we find it to consist of an internal and external columnar epithelial layer of cells. Just within this layer we find another, the stratum intermedium; within this the whole central part we find filled with star-shaped cells, the stellate reticulum. The cells of the stratum intermedium are intermediate in character between the bordering epithelium and the star-shaped cells. Dr. Beale asserts that he has seen a vascular net-work in the stratum intermedium. I have

never been able to see it. The dentine germ is very different from the enamel organ; everything in it shows vitality. Numbers of minute blood vessels run everywhere towards the surface of the germ. Nerve bundles throw out numberless fibrils toward the odontoblasts; the tissue is crowded with life. The odontoblasts butt up flat against the enamel cells; they are never pointed, as many observers have shown. This appearance is caused by shrinkage, and is not to be relied upon.

The accepted authorities speak of an isolated odontoblast as a cell, having no membrane, with an ovoid nucleus, and also different processes which they call dentine, lateral and pulp processes. They say that the cell calcifies at its outer edges, while the protoplasm in its more central portion forms the sheathe by its partial calcification, and also the fibril, in some mysterious manner wholly unexplained. If my observation teaches me anything, it teaches me that this is all a very great mistake. I have repeatedly seen, and shown to many of my microscopical friends, these cells merging into and forming the matrix or basis substance of the dentine, its nucleus, granules, protoplasm, and all, losing their identity and forming only matrix. The processes they speak of are not really processes of the cell, but are portions of broken fibrils that come from the deeper layers of the germ or pulp. This can be shown by careful manipulation. I have seen these fibrils running between and under the odontoblasts. They break away when the cell is isolated and look like processes, but they are not. The fibrils are not formed from the protoplasm of the cells. They look as though they came directly from a fiber from one of the nerve bundles. I have not been able to trace one entirely, as I cannot make a section on a line with their wavy course. If I could, I think I could prove my point. I have seen the fibrils between the odontoblasts—this is certain. Frey, in his Histology and Histo-chemistry of Man, well says that the study of the development of the teeth, even in its coarser outlines, is one of the most difficult in embryology. As I have said, I believe time will demonstrate that the fibril which is within the sheathe is a filament from a fibril which comes from one of the nerve bundles. I have among my specimens some showing a nearly half-formed tooth of a calf; cross sections of this tooth show just within the odontoblastic layer, and near these cells, very many large nerve bundles, cut across, full of minute fibrils. The open blood-vessels, fewer in number, are nearer the central portion of the pulp. I have also seen, on compressing a thin section showing a cluster of

odontoblasts attached to forming dentine, a fibril or filament running between separated cells from the formed dentine quite a little way into the substance of the pulp or germ. It will be remembered by those of you who are familiar with the writings of Boll* that he has traced fibrils from the nerve bundles running through the pulp, or germ, towards and between the odontoblasts. I have seen, and I can show these filaments running from the germ, between the odontoblasts, up to the formed dentine. These filaments are so transparent that only the most careful examination, with properly directed illumination, will show them. I have certainly proven to my own mind that the odontoblasts lose their identity, and merging into their neighbors, form, when calcified, the matrix; that portion of the odontoblasts surrounding the fibril only partially calcifies and forms the sheathe. New layers are formed by the cells that are seen to be just within the pulp, under the calcifying layers; these become the odontoblasts and they go through the same process.

I look upon the odontoblasts, from continued observation, as having the same function as osteoblasts; and the function of the osteoblast, as I observe it, is only to form the matrix of bone. I believe, with Dr. Sharpey, that the lacunæ cells are bodies or cells left between the calcifying osteoblasts, having a different function. It will be remembered that the emeloblast or enamel-forming cell calcifies, and loses its individuality when calcified, leaving no trace of any former structure. Bödecker has beautifully shown that a very slight beaded filament, or fibril, is found *between* the calcified rods. Those beaded fibers I propose we shall name in honor of the discoverer, the fibrils of Bödecker.

Those of you who have followed my paper closely will have found my conclusions to be:

1. That the odontoblast calcifies and forms only the matrix, or basis substance, of the dentine. When it is fully calcified, it has lost all signs of form and contents. Having no membrane, it merges into its neighbors, and forms the hard portion of the dentine, in the same manner that the osteoblasts form bone.

2. That the sheathe is formed by that portion of the surface of several odontoblasts that enclose the fibril or filament which passes

*He found that by treating a perfectly fresh pulp with one-eighth per cent. solution of chromic acid, an immense number of fine fibers could be demonstrated, a great many of which projected from above the surface, as though they had been pulled out of the dentinal tubes; these pass up from a plexus of dark bordered nerve fibers beneath the layer of odontoblasts.

between them. The portion of the odontoblasts enclosing the fibril only partially calcifies, and is composed of that peculiar substance found everywhere on the border land of calcification—a substance singularly indestructible.

3. That the fibril found within the sheathe between the calcified odontoblasts is a filament either from a nerve bundle or from some other element deep within the formative pulp. From continued observation, I am inclined to think it comes direct from one of the many nerve bundles.

I feel certain, from what I have seen, that later and better observers will prove that I am not wrong in my conclusions. These I arrived at nearly seven years ago. It is gratifying to me to find that so late and so eminent a writer as Klein, in his investigations on this subject, agrees with me on, at least, one important point. Thus, in his Atlas of Histology, page 185, he says:

"I cannot convince myself of the now (since Waldeyer) generally accepted theory, according to which the peripheral part of cell substance of the odontoblast is transformed into the matrix of the dentine, while the central part persists as the dentine fiber. From my observations, I am, on the contrary, led to assume that the superficial layer of cells, or odontoblasts proper, *yield only the dentinal matrix*, while the dentinal fibers are derived from the processes of the cells of the deeper layer; that is, of the cells wedged in between the odontoblasts just referred to."

A HISTORY OF DENTISTRY.

BY GEORGE H. PERINE, D. D. S., NEW YORK.

[Continued from page 166.]

THE THEORY AND PRACTICE OF THE MIDDLE AGES.

Between the time of Aristotle and Galen, who was born at Perganus about A. D. 130, but little progress was made in medicine. Galen studied his profession at Smyrna, Corinth and Alexandria. At the age of 34, he settled in Rome, but often made professional visits to other places. He was undoubtedly a man of great perseverance and deep thought, and has left behind him numerous professional writings, in which he describes the teeth with more exactness than any of his predecessors. His description of the form of the roots of the molar teeth is most accurate, and he asserted that the teeth were connected with a

branch of nerves. He demonstrated that the teeth were not deprived of sensibility when filled, and, as a remedy for toothache, he recommended above everything the use of vapor baths, and the introduction into the tooth of a small piece of wax, pressed well into the cavity by means of an instrument. He taught that the teeth were true bones which were formed in the fœtus, but only became apparent after birth. Galen is very justly called "the patriarch of medicine." He died at the age of 70.

Facts concerning the practice of dentistry during the early portion of the Christian era are not easily obtained, perhaps for the reason that, unlike Galen, the majority of physicians considered its study and practice of little importance. There were not, however, wanting those who went to the other extreme and overrated the benefit the practice of the specialty would confer upon mankind generally. One would at the first appearance of pain ruthlessly extract a tooth, while another would prepare the patient for the operation by copious bleedings, purgations and general persecution of a professional character, until the offending tooth was very likely the healthiest portion of the poor victim's anatomy. As a rule, the patient was within a limited period killed either by too little or too much care.

Bruno, of Longsbuns, favored the burning or cautery treatment. With a hot iron he attacked diseased gums or aching teeth indiscriminately. He opposed extraction by means of instruments, but recommended the application to the root of a mixture of milk, thistle juice and flour, which he claimed would cause the tooth to loosen and fall out.

Gagliardi was the first who described the enamel of the teeth, and obtained sparks from it by striking it against steel.

Clopton clearly established the difference between the enamel and the dental bone, and asserted that in the latter he had discovered traces of the filaments of nerves.

A. Fabrice d' Aguapendente seems to have been a practitioner of considerable merit, and did his operations very much the same as those of the present generation. Thus, when a tooth was carious, he removed the deposit with instruments, destroyed the nerve with a red-hot iron, and proceeded to fill the cavity with beaten gold. He devised many instruments, many of them quite ingenious and well adapted to their purpose.

Peter, of Spain, we are informed, had great confidence in the theories of magic, and permitted his powerful superstition to influence in a great measure his method of practice.

At the time of which we are writing, dentistry had made comparatively but small progress as a science, although surgery was making some little advancement. Occasionally, however, an improvement upon some old and mistaken method would appear which, after some hesitation on the part of the profession, would eventually be adopted. Instruments which were but poorly adapted to the purpose for which they were intended were by degrees rendered less cumbersome and dangerous, and consequently the objection to extraction began to decrease.

The theory that caries was caused by worms, however, gained ground, and held for a long period a prominent place in the public mind. Physicians tried numerous experiments with a view to getting rid of these imaginary parasites. Some burned out the diseased teeth with the wood of the ash and afterward filled up the cavity with honey. Others retained their faith in the inevitable red-hot iron—all having in view the same worthy object, however, that of making the residence of the worm decidedly too hot for him.

As we have before stated, it is generally believed that the Egyptians and Greeks in past ages practiced filling decayed teeth, but their successors of a later period made no attempts at operations of this character, if we except the employment of resinous and aromatic substances introduced evidently into the tooth more with a view to allaying the pain than to arresting decay.

John Arculanus is one of the first who refers to the filling of teeth with gold in the middle ages. He paid particular attention to the temperature of the teeth. When the disease was of a cold nature, he believed it was necessary to use warm substances, and *vice versa.* In order that the heat should penetrate as deeply into the tooth as possible, he broached it as far as he was able with a small instrument. Gold filling was not, however, used to any very great extent until the eighteenth century.

Beneditti, with blind and amazing crudity, gave his attention to the study of the imaginary worms and their habits. To destroy them he recommended the use of *eau di vie*, but condemns opium as an agent. Judging from the quantity of the first-named, one would be justified in the belief that the erroneous impression regarding worms existed to a large extent at the present day. Beneditti, to impress upon the mind of the practitioner the dangers attending the use of opium, wrote: "I have seen the abuse of this drug plunge a gentleman of Padua into an eternal sleep."

With a seeming anticipation of modern methods of treatment, Jean de Vigo used the file and rasp for removing caries, and filled the cavity with gold leaf. When alveolar abscesses were found, he permitted them to ripen, and then treated them with honey and ointment. He wrote very strongly against the inconceivable quackery and charlatanism prevalent in dentistry, and demanded very justly that only surgeons, and not traveling barbers and mountebanks, should be permitted to practice it. His remarks upon this subject would in some instances be applicable at the present day. Happily, however, dental chairs have been and are being established in the prominent medical colleges, and we are consequently justified in believing that the child, so long estranged from its parent, will soon again be embraced in the arms of its mother; that, in fact, dentistry will no longer be looked upon as a mere mechanical trade, but as an important arm of surgery and medical science.

About the year 1588, Gautier Henry Ryff's work appeared. It was the first book devoted entirely to dentistry as a science. The book did not, however, contain many new ideas, and we find no mention of it in the works of those who wrote about the same time.

A work on Dental Medicine, of which Adam Bodenstein was the author, appeared also in the latter part of the sixteenth century, but its style was eccentric and its theories erroneous. A few other works appeared about the same time in Spain, Switzerland and Italy.

De Coiter Valcherus described, in 1566, most accurately the dental pulp, and explained the difference between the ossification of the teeth and the bones.

About 1653 Duverney published an excellent description of the teeth, observing that in their development and culture they bear a strong analogy to feathers, the nails, horn and hair.

Nerhegan was so strongly convinced of the perfect analogy between the teeth and nails, that he was led to believe that the teeth grow without cessation through life just as the nails do. Were this theory true it would give employment to a large corps of specialists whose duties would constitute the filing down of those teeth which grew so rapidly.

Diemerbrœck commits the singular fault of maintaining that the teeth are formed after birth, and that the roots of the temporary teeth give origin to the permanent ones.

Peter van Forcest, first by an experiment upon himself, discovered that the ulceration of a tooth sometimes sufficed to relieve pain, but

that relief thus obtained was only temporary, and that to effect a cure in extreme cases, extraction must be resorted to; and in this connection he has given the first description of the "pelican," although that instrument had been in use a considerable period prior to his time. He did not, however, consider its use safe, owing to the danger which existed of fracturing the tooth, and he proposed as a substitute an instrument "shaped like the hoof of an ox." Whether his improvement was adopted by the practitioners of his time we are unable to say.

Antonio, of Altona, gave particular attention to the subject of odontalgia and suggested remedies in accordance with the cause of the trouble, but in all cases where the teeth were much decayed or loosened, he advised extraction.

J. André de la Croix is reported to have cured an abscess of the jaw by the removal of a decayed tooth.

Flajani was of the opinion that André's operation was among the first of this character, performed.

It is said that Achille Permin Gassir extracted one of his own teeth, but with so little skill as to remove a portion of the alveolus with it, and that, owing to the profusion of the hemorrhage which followed the operation he became exceedingly pale, and remained so up to the time of his death, which did not occur for several years thereafter.

Fabricius Hildanus, of Aquapendente, was quite successful in his method of treating fistulas, hemicrania, etc. For the extraction of molar teeth he used the "pelican" adapted to either side of the mouth, and for the front teeth an instrument resembling a crow's-bill, and for the removal of roots one which acted with greater force than the "pelican." Having witnessed the injurious effect of aqua fortis upon the teeth, and superior and inferior maxillary, he recommended in its stead the use of simple dentifrices for their preservation.

Jean Hurnius had evidently little faith in the dentist of his time, for his advice was not to be hasty in applying to one because, as he stated, odontalgia often arises from some internal cause with which the dentist has no acquaintance.

Strobelberger entertained, however, a more favorable opinion of the specialty, for he advised when a tooth was to be extracted that a skillful dentist should be consulted, "as the operation is one requiring dexterity, which can only be acquired by constant practice."

Severino is reported to have been highly successful in removing tumors from the oral cavity, for which purpose he used forceps made of wood.

Claudius Deodentatus was the surgeon to the Bishop of Basel, and carried with his opinion much weight among dentists of the seventeenth century. He opposed the use of aqua fortis in the treatment of diseases of the teeth, believing that it destroyed the teeth and the alveolar process. He advised the use of dentifrices and general treatment of the teeth and gums.

The belief in dental worms still existing, many ridiculous and singular statements have been made regarding these myths. It is stated that Olig Jacobeus, having excavated from the cavity of a diseased tooth the carious deposit, saw a worm come from it which lived in water for some time. It is quite reasonable to presume that a microscope in the hands of Olig, or, more correctly speaking, beneath the corina of his eye, would have proved his worm a creature of his imagination. But science was in its infancy, and he was consequently permitted to indulge in the harmless pastime of seeing diminutive snakes to his heart's content.

Philippe Salmuth practiced under the same belief, but his faith in worms was entirely eclipsed by his belief in golden and iron teeth, which the dentists of the seventeenth century believed to actually exist, the presence of which they explained by various theories too ridiculous to mention.

Horetius, who wrote in 1595, described a tooth of gold with which a child was said to have been born.

Before closing this chapter we will refer to a few writers and practitioners whose reputations are of sufficient prominence to entitle them to mention.

Louis Crow opposed the lancing of the gums before extracting teeth, and recommended the loosening of teeth by moving them backward and forward instead of removing them, as was generally practiced.

Vauguion, though he advanced dental surgery but little, was by no means favorably disposed toward the employment of the lancet prior to extraction, except in cases of broken or projecting teeth where the "pelican" could not obtain a firm hold.

Henry Meibomeus was evidently but little acquainted with the diseases of the antrum. He entertained the erroneous idea that the mucous membrane of the maxillary sinus was the cause of the disease. "Some practitioners," says this writer, "endeavor to introduce various medicines in the form of vapor into the antrum, but the best method is to make an opening by extracting a tooth, as the matter

can then escape readily." Meibomeus' father, who was a physician of prominence, practiced with success the same method. By referring to that portion of our work devoted to the practice of the specialty in England, it will be seen that Dr. Nathaniel Hyghmore, in 1643, made some very valuable discoveries regarding the anthrum, by whom it was named.

SCHNEIDER, of Wittenberg, an anatomist of ability, published, in 1661, a treatise entitled "Dr. Catarrahis," in which he explained that the secretions of the nose came not from the brain, as was generally believed, but from the membrane of the olfactory organ.

BENJAMIN MARTIN issued, in 1679, a volume which he called "A Dissertation upon the Teeth." It treated of the nature of the teeth, their sensibility, their development and diseases, but did not advance any theory or method by which they could be preserved. This work, despite its incompleteness, was conceded to be one of equal value with that of Hunard's, which was published in France in 1582.

From the foregoing statements, it will be seen that the veil of superstition, ignorance and bigotry, which had for so long a period enveloped matters relating to the practice of the specialty, and in a great measure retarded its improvement, began in the seventeenth century to dissolve before the light of reason and the advancement of thought and sounder judgment. The literature of dentistry may be said to have sprung into existence about this time, for, during the seventeenth century, more than forty works upon the teeth made their appearance, in addition to numerous general treatises which contributed many valuable ideas to a rapidly developing knowledge.

BACILLUS.

BY J. M. ADAMS.

If the late idea advanced be true—that the bacillus be nothing but fat cells modified—then it would not hold good that they exist where no fat exists, particularly where the fat has all been absorbed.

I once found a spring-poor old bat, so poor that he was about dead and had nothing but a few feathers over his lean flesh and bones, and yet his blood, as well as muscles and lungs, were literally filled with well-formed bacilli. He was really poisoned to death by these numerous bacilli, and not a granule of fat could be supposed to exist anywhere in or about them, and they multiplied all the more, the more diseased the animal became—no fat to absorb, no fat could exist in such a state, and no fat at all.—*The Microscope.*

EDITORIAL.

THE LATE UNION MEETING OF DENTISTS IN SPRINGFIELD.

It was a very pleasant sight to the outsiders to see two societies which, under other circumstances and in other States usually are rather warring against each other, come peacefully together and hold a love feast. This was done from June 6th to the 8th, at Springfield, Mass., by the two societies—the Massachusetts Dental Society and the Connecticut Valley Dental Society, both of whom number about one hundred members each.

The meeting has to be considered a success socially and professionally, in spite of the very oppressive heat that prevailed during the days of the meeting.

Dr. Searle, the veteran dentist in Massachusetts, who is now over forty years in practice, acted as the president of the union meeting. Dr. N. Morgan, of the Connecticut Valley Dental Association, alternated with him. A great deal of the management of the meetings depended upon the executive committee, of which Dr. Bartholomew was chairman, and who displayed his peculiar firmness of character in a way very prosperous to the proceedings of the convention. Many dental stars were present, one of them, Dr. W. C. Barrett, of Buffalo. Who does not know the portly huge gentleman, full of authoritative vigor and vitality? We do not think that Dr. Miller, of Berlin, could have chosen a better agent for his views than the Buffalo doctor. We would like to know that dentist who ever saw Dr. Barrett get tired or short of words. There was one able to cope with him, but he was conspicuous by his absence. It was "Papa" Atkinson. Now how could you, Papa, leave your children thus alone? We only had the excellent crayon portrait of Dr. Atkinson, executed by Dr. Davenport, of North Adams. The picture lacks only two things—mobility of the lips and "shakability" of the hair.

Dr. Niles, whose outward appearance might make one believe that he was very young, shows that the training at Harvard gives to a dentist advantages that years of empiricism cannot produce.

The noted microscopist of Cambridge, Dr. Andrews, was also present, and gave a most interesting lecture on the development of teeth, printed in full in this number. If a phrenologist was collecting proof, he would have to consider Dr. Andrews a fine specimen of the development of the higher faculties.

Dr. Bonwill gave an interesting paper and clinic on the important question of "crowns." Dr. Bonwill is the typified professor; he explains things so that every one has to understand him, in a lively manner, somewhat resembling that of a Frenchman; his stereotype "very well" corresponds to the French "*eh bien!*"

Dr. Buttner, of New York, who gave a clinic on crowns, met with good success.

Dr. Clark, the veteran of the Germ Theory, was also here, raising the value of the meeting by his presence. He gave some very hard nuts to crack to Dr. Barrett, alias Dr. Miller.

And then there was the ubiquitous Prof. Mayr, of Springfield. Many dentists know that young chemist. At this opportunity, he gave a paper on some obstruse philosophical ideas, but thunder showers and the heat made it rather heavy food; and for the purpose of giving the profession an opportunity to study his views, we shall print his paper in the next number. He seems to us to talk rather much, but generally to the point; yet, who can resist replying when all over the globe one is made the subject of discussion, attack and crucial tests?

When we first read articles of Dr. J. L. Williams, then of Vassalboro, Me., now of New Haven, we got the idea he was an old man, about sixty, nursed in all the combined prejudices of Baptists, Methodists, Agassiz, etc.; but when we met him at the meeting we found him one of the most clear-headed, open-minded, rather young and attractive looking men in the meeting. One cannot help feeling very friendly towards him.

Old Dr. Robinson, of Jackson, Mich., who was present too, is as lively as the youngest, full of wit and experience; he has seen more of the dental world than almost any half-a-dozen of men put together.

The general esteem in which Dr. Chandler, of Boston, was held by all present was certainly due to more than his position as professor of the University at Cambridge. He is the translator of several dental works of Magitot, etc., and has been by this fact alone a strong pillar of their reputation.

Dr. Brackett, of Newport, R. I., newly elected to Harvard University, Dr. Coolidge, of Boston, Drs. Lovejoy and Bazin, of Montreal, helped to increase the splendor of the meeting by their presence. Taking it all together, it was perhaps as large and influential a meeting of dentists as Massachusetts ever saw.

Dr. Charles A. Brackett, of Newport, R. I., has been elected professor of dental pathology and therapeutics by the officers and fellows of Harvard College. Prof. Brackett, as assistant professor, has filled the chair for two or three years past, and we now extend to him our hearty congratulations on his well deserved promotion.

SOCIETIES.

UNION MEETING OF THE MASSACHUSETTS AND CONNECTICUT VALLEY DENTAL SOCIETIES, HELD AT SPRINGFIELD, MASS., JUNE 6, 7, AND 8, 1883.

First session, June 6, opened 2 P. M. in Gill's Hall.

Dr. F. SEARLE, president of the Massachusetts Dental Society:

Gentlemen of the Massachusetts Dental Society and the Connecticut Valley Dental Society,—

It is incumbent upon me to open this meeting and to call the convention to order, and in doing so allow me to tender you the hearty welcome of the dentists of Springfield. We are greatly obliged to you for having done us the honor to make this your place of meeting.

The weather is rather warm, and possibly you may not feel disposed, after the convention, to spend much time in visiting the various places of interest and some rare works of art and architecture which we possess; but, so far as you may be able to do so, we shall be happy to give you all the assistance in our power.

Let me say to you, gentlemen, that we have one work of art especially deserving your attention. You can see costly and nice buildings everywhere; you can see all the modern works of architecture, but such a specimen of architecture as may be seen in the old Springfield bridge you will not find elsewhere. We welcome you especially to this.

The executive committee has placed before us the two main questions of to-day, which will come before you for your investigation. I refer to the Germ Theory and its merits in comparison with the old Acid Theory—perhaps I should not say *old* acid theory, because it is only about forty years old—and, also, the merits of the different processes of pivoting teeth. I use this term because you all understand it, viz: Artificial crowns are put on remnants of teeth, which is nothing more or less than an engrafting of artificial teeth upon dead teeth. I hope that, in this discussion, the question of the advisability of using old roots in this way will be especially noticed.

Without going further, I give you a hearty welcome and hope you will have a pleasant meeting. The two societies have each their own set of officers. What action will you take under these circumstances?

Dr. BARTHOLOMEW: The executive committee of the two societies instructed me to move that the officers of the union meeting be those

of the two societies—Drs. Searle and Morgan to preside at the various meetings. (Voted.)

Section No. 1 not being ready to report, Section 2—Pathology, Therapeutics, Etiology and Diagnosis, was taken up. Dr. Stockwell, of Springfield, chairman of section, reported that two important papers were to be presented under this section, both of them by men to whom they would most gladly listen—Prof. Chas. Mayr, of Springfield, Mass., and Dr. W. C. Barrett, of Buffalo, N. Y. It is desirable that Dr. Barrett's paper on "The Experiments, Observations and Conclusions of Dr. W. D. Miller, of Berlin, Germany, concerning Dental Caries," should be deferred until to-morrow. Prof. Mayr is present, and ready to present his paper. (To be published in next number. Ed.)

DISCUSSION.

Dr. W. C. Barrett: It affords me great pleasure to be with you to-day, in that a large proportion of my life has been devoted to the profession which I have chosen as the highest aim of my life. There are men in our profession who arrange things and facts and ideas and thoughts, and present them to us in a new form—perhaps more practical. Such men are very useful, but those who are doing original work—the man who goes back and looks with his own eyes on the phenomena presenting themselves—that man is the one to whom we listen with a great deal of pleasure. Prof. Mayr, although not a professional dentist, has engaged himself in this kind of work, and whenever he speaks I listen to him with pleasure. Whatever he writes, I read with profit. It does not matter whether I agree with him or not. To any man who gives me new thoughts I am thankful, for I think if we all saw things alike, and would all look through the same kind of spectacles, there would not be much progress. If every man was posted and planted in the ground, and should say, "I am always consistent, you can always find me there, you know where I stand, and where to find me," I would not give "that" for that man. If we are to derive profit from discussions, it is from some man with whom we come in collision. You may strike two rolls of butter together and you will never get any fire out of them, but when you have a piece of flint and of steel, and you strike them, you will get fire. If two minds which are acute, strike, you may get something; and on the ground of this consideration I should be glad if in any way I could come across Prof. Mayr. I should hope to strike fire from him. The subject of Etiology is striking at the foundation of dentistry. The man who

attempts to treat pathological conditions without understanding the cause which leads to that state of disease, is simply an empiric. But when we go back and understand principles, how we get this condition and how we get that one, then we begin to practice intelligently. There is no more vital question than this in all dentistry. When we come to pathological conditions, whence came it? what was its origin? Is it the cause of some change or the interjection of some force, or does it originate in a malconstruction? Take, for instance, the investigations of Prof. Mayr. They have led him to the conclusion that he has found the cause for that disease of teeth which all of us combat; he ascribes decay to certain organisms which are found in the mouth. I am quite ready to agree with him that a great many zymotic diseases are due to microscopical organisms, of which we knew nothing a few years ago. The telescope does not reveal greater creations outside of our globe than does the microscope. The infinitely small is much more than the infinitely great. The difference between planets, between orbs, between worlds, is not so great as the difference in the microscopical world. The animals which roam through the inexplorable African forests, if we should be transported there and should meet them, forms of which we have never heard and which we have never seen, they would not astonish us as much as when a man looks for the first time down through the tube of a microscope at the infinitesimal world and the wonderful forms there seen. The infinitely small creation transcends the infinitely great. The microscopical forms of life transcend the macroscopical ones.

Man's thoughts are apt to run in channels. When the high water of the river comes down, all the driftwood lying along its course is swept into the current, and all goes down together. The same is true of the sciences. When Pasteur and Koch made their investigations, and determined to their own satisfaction that certain pathological conditions were due to the action of minute organisms, we are so apt to ascribe everything on earth to the same cause. If they show that cholera and many of the zymotic diseases are the results of microscopic organisms, we ascribe all conditions to the same cause. We are apt to seize one point, and look only at that, which we have to guard against. I think we have made greater progress in the dental profession in investigations of such kind than ever before. Right here in Springfield, right here in this city, has been a center from which has gone out an influence which will be felt throughout the world of dentistry. It is but a few years ago that it began here,

and from this center in Massachusetts has spread all over the world. I am speaking generally. I want to state the platform upon which we all can stand. We have not reached our ideal. We have proved the presence of micro-organisms. I do admit that microscopic organisms do have a large influence in caries, but cannot admit they are the sole cause. I am not ready to admit that they are even the primal cause.

I occupy a somewhat anomalous position. When, two years ago this summer, I had occasion to meet a young man, an American, who was expatriated by his own choice, a man who was an enthusiastic dentist, an educated man, a student in every meaning of the term, a man of such a lovely spirit which does us good to meet, and which we hold to our hearts whenever we meet them. There he was, in a foreign country; he was making scientific investigations; he was alone in that there was no dentist to assist or sustain him. He wanted to retain his place among American dentists. He said, "I am at a great disadvantage; I desire to be known to the profession; I am so far away, I cannot speak to them; I cannot enter into the discussions; I cannot present my views to the profession in general; the only way in which a man can make progress is by coming into collision with others. I have nobody for that purpose." We had considerable correspondence. He finally asked me if I would become his mouth-piece. I was delighted with the offer, and said I should be glad to present, whenever there was an opportunity, in the best manner that I could, anything he might desire to say, before the profession. At that he sent records, slides, diagrams and drawings. As he commenced, and the subject began to open itself before him, he took a certain ground. After six months, he said, "I have to review the whole thing; I am satisfied I am wrong." Then he went to the other extreme. A short time afterwards, he said, "I have got to modify again my views." And so that man has gone on, and there is perhaps not a man in the profession that has been superior in the number of experiments and observations and studies to Dr. W. D. Miller, of Berlin. Your executive committee invited me to come here, but when Dr. Miller invited me to become his mouth-piece, it shut my own. I have agreed to be Dr. Miller's mouth-piece, and to present his views whenever he desired to have them presented. If I do that, loyalty demands, if I hold views which are not in accordance with his, that I should not create any antagonism; if, on the other hand, my views coincide with his, loyalty demands that I present none

of them, because they are his views. He wrote a paper expressly for this meeting, when he learned that a meeting would be held here. As I have the pleasure of presenting to you his views, I have nothing of my own to present.

SECTION 1.—*Anatomy, Physiology, Histology and Microscopy.*

Dr. S. E. Davenport, of New York, chairman.

Paper by Dr. R. R. Andrews, of Cambridge, Mass. (to be found in this number in full).

DISCUSSION.

Prof. MAYR: I take the liberty to say a few words in regard to the paper of Dr. Andrews.

It is an excellent paper, but, as I have pointed out in my paper, the treatment with chromic acid seems to have produced a series of troubles; the authorities and microscopists are very much in doubt about the presence of lime-salts. As long as they treat their specimens with chromic acid and remove the lime-salt, they must not expect anything else. As soon as we remove the lime-salts to accommodate the razors of microscopists, we are thrown into confusion, and have to guess where they were. That is no scientifical way of investigation.

Dr. Andrews speaks further of picking out certain slides and rejecting others: also that seems to me to offer an objection. We must look at all the slides that can be made from one specimen.

Prof. ANDREWS: I would merely say that the specimens were taken at a time when there was no lime yet deposited.* I do not care to see them. Then in making the slides, many did not contain anything about the teeth, and were therefore useless.

The chairman of Section 3 not being ready to report, a paper on "Fisk Caps and Method of Application" was given by Dr. H. C. Meriam, of Salem, Mass.

(Will appear in one of our next numbers).

Adjourned.

EVENING SESSION.

Opened at 7.30.

SECTION 3 taken up—*Chemistry, Materia Medica and Anæsthetics.*

Dr. E. S. Niles, of Boston, chairman.

Paper of Dr. Niles on the "Chemistry of Decay."

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*That is precisely the point. How does Dr. Andrews know that they were not there after he has treated them with chromic acid? He would surely have dissolved them out.—M.

(Paper given in extract).

Dr. Niles: Whatever differences of opinion may exist upon the causes, progress and character of caries, there seems to be a general agreement that the condition rendering decay possible is a faulty development of the structure, and in a general way it is recognized that the imperfect formation of enamel and dentine has to be attributed to scanty assimilation of the material that makes a typical development of structure. Those changes which occur in the progressive development of embryonal teeth are imperfectly understood. We know that all important tissues and organs of men are evolved from minute masses of cellular matter, called bioplasm. The hardness of a tooth is in the proportion of its lime-salts.

First take enamel, the hardest substance about the tooth, and we find it to contain a greater amount of lime-salts than dentine. I have these analyses:

Enamel, 89.82
Dentine, 66.72
Bone, 54.51

The first two analyses are by Bibra. The last by Wurz.

It is seen that the analyses of those eminent authorities differ from the conclusion drawn by other men, in that a large amount of lime-salts is present in the hardest dental tissue. In later life, the teeth contain a great proportion of earthy material. Among most of those who have made dental pathology a study, it is generally recognized as a fact that teeth resist in proportion to the amount of lime-salts in them. Among the conditions rendering decay possible are a faulty development of the structure and lack of earthy salts. Speaker refers to the practice of prescribing lime-salts in diseases when the lime supply seems to be deficient.

As in all theories of decay there are some truths that claim our attention, so in the most recent one, there are facts which contribute to the final solution when dental caries shall have been fully explained.

After one has studied the Germ Theory, it would seem clear, whatever its defenders might prove with reference to soft tissues, that further light from it will be small if applied to hard tissues.

If those who advocate the Germ Theory admit that acids unclose the organic matrix of teeth, they explain what Magitot's experiments prove, that caries are produced by the product of fermentation carried on about the teeth.

Fermentation is the spontaneous change of a liquid or a substance which results in producing substances which differ from those previously existing.

Putrefaction is the decomposition of animal substances when deprived of life and placed under especial circumstances, viz : a temperature of about 70° Fahrenheit, and the presence of moisture.

The most common products of putrefaction are water, carbonic acid, acetic acid, carbureted hydrogen, etc., and the volatile odors of putrescent substances. Both of those processes are attended by swarms of micro-organisms.

At present, the names of bacteria, germs, micrococci, etc., are given to races of organisms whose names are legion. We take untold millions in our drinks and food.

It is claimed that a peculiar species is responsible for every known disease. We have small-pox germs, yellow fever germs, and, in the minds of men with strong imaginations, a germ destructive to human teeth during life ; but, strange to say, at the death of the human body, its ravages cease. The soft tissues are destroyed, but the teeth and bones are left with their usual density for many years. It seems strange that the supporters of the Germ Theory of decay should maintain the position merely because those germs are found in the cavities of carious teeth, when it can be proved by experiments out of the mouth that germs have no power whatever to decalcify tooth structure. The only portion favorable to their production is the organic portion. According to the analyses of Bibra, the enamel structure in an adult consists of lime, magnesia, and other salts, 96.41 ; organic substances, 3.59.

It is readily seen that but a small proportion of the enamel structure is favorable for their propagation, as it is buried or loaded down with great quantities of lime-salts, which act as barriers to the progress of germ-reproduction.

But the editors of the *New England Journal* teach that bacteria excrete or secrete an acid. In other words, that they are acids forming bacteria ; and, after feeding themselves, crowd down the tubuli and there disgorge themselves of the destructive fluid.*

The question is, are the acids products of the living organism, or are they directly chemical products. I have very good reasons to believe that the advocates of this theory will find ample authority in

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*This is a gross mistake on the part of Dr. Niles, and shows a reading so careless that—we are sorry to say it—to all his statements an ? must be appended.—Ed.

the works of Beale, Pasteur and Tyndall, to convince them that these acids are formed by the ultimate decomposition of proximate principles.

For example, fermentation is a decomposition of starch and sugar, and the recombination of their ultimate principles—oxygen, hydrogen and carbon in new proportions. This breaking up is brought about in the time of reproduction of the germs; and when we call to our mind the marvelous rapidity with which they are produced, under favorable circumstances, it is doubtful whether they have time for anything else, especially in the presence of enamel and dentine.

In a final sentence, Tyndall says: "There can be no doubt of the fact that for the nutrition and multiplication of bacteria, acid infusions are less favorable than neutral or slightly alkaline ones." From reliable sources of information upon the subject of bacteria, we are led to the conclusion that their object is to reproduce themselves and to exist at the expense of decomposing matter, and that the fluid which best favors their germination is not acid, but neutral and alkaline. Further proof is presented every day to the practitioner during the progress of the affection known as Riggs' disease. The pockets formed at the root of the teeth and in the surrounding gums would be a favorable condition for the germs to decompose the tooth structure. It is found, however, that caries of the root with Riggs' disease seldom occurs. Beale and Pasteur first demonstrated the presence of germs and their multiplication in soft tissues under diseased conditions. Lister was the first to make practical application of this knowledge in the use of the carbolic antiseptic treatment of wounds.

A small quantity of carbolic acid arrests germinal development, and if this is used in carious teeth, decay will be arrested. I am aware that this has been offered as evidence that germs cause decay. It kills the germs, but it is also true that carbolic acid arrests fermentation and putrefaction, and therefore no organic acids can be developed.*

Speaker refers to the experiments which he supposes to prove that germs alone do not decalcify tooth substance. Teeth were ground up and placed in a liquid containing decay of teeth, but care was taken to keep the liquid neutral or slightly alkaline. At the end of two months, not a trace of lime can be found in the solution, nor is there the least softening on the surface of the teeth, while millions of spores, germs and bacteria are floating in the fluid.

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*"Carbolic acid arrests fermentation and putrefaction" because it "kills the germs." Therefore, no "germs," no fermentation or putrefaction, and, consequently, no caries.—Ed.

Some experiments or tests on caries have recently been made which are said to prove the absence of acids along the line of action, as I am informed. These tests are for acetates, lactates and nitrates of lime. From the same source comes the statement that litmus is not reliable and does not prove the presence of acids.

In answer to this statement, I would say that the absence of lactates, nitrates and acetates of lime, even in fifteen cases, is not sufficient to prove the absence of at least fifteen or twenty other organic acids which may assist in changing the tooth structure. Nor is it reasonable to suppose that under the fermentative action in the presence of varying quantities of numerous acids and acid salts, any acid salt can be created in sufficient quantities to respond to any known test. It has been said from this same source that all carious tooth cavities are a whole chemical laboratory. (Oh, no, Dr., not "from the same source." Again, a mistake.—Ed.) With some modifications, I am inclined to accept this statement, and if, by chance, acetates and lactates should be formed, their existence would be of short duration. About the litmus test for acids, in this case it must be regarded as very significant that the healthy flowing saliva turns red litmus blue, and this also destroys the power of teeth to turn it red. It is also true that litmus usually indicates alkalicity around sound teeth in the mouth. But where decay has made much progress it indicates acids. By experiments on forty teeth, it was proved conclusively that decay has an acid reaction. Every argument only proves to strengthen the conviction that acids are the primary local cause. The existence of organisms in decay is rendered possible by the continual exposure of the organic substance of teeth, and the contribution of favorable substances from food and saliva, and their being kept constantly in temperatures favorable to their reproduction. It has also been said that decalcification out of the mouth does not resemble decay. I have decalcified some teeth which I will show you, and I leave it to your judgment whether it looks like decay or not. This decalcification was done by dilute *muriatic acid*. Speaker proved the presence of lime-salts in the solution.

Prof. Mayr: To answer Dr. Niles in some of his points is very easy. First, he has given you a table by which he wishes to prove that the hardness of a structure, like teeth, depends on the amount of lime-salts. To prove the fallacy of that view, I will complete the table:

Chalk, 98 per cent. lime-salts.			
Enamel (Dr. Niles),			89.82
Dentine,	"	"	66.72
Bone,	"	"	54.51
Chitine			4.

By simply arranging my figures in this way, you will see that it is a fallacy to make hardness—a perfectly physical property—depend on the chemical composition.

Chitine, with only 4 per cent. of lime-salts, is much harder than chalk with 98 per cent. Furthermore, if we pound up a tooth, we do not change its chemical composition, but its hardness is completely gone. You see, therefore, that hardness has hardly anything to do with the *chemical composition*, but depends mostly on the STRUCTURE.

The structure of a tooth is its physical arrangement, and the difference between hard and soft teeth, as between hard and soft steel, is but very little in their chemical composition, but in the arrangement and disposition of their molecules.

Another point I would like to touch is about the litmus test. I did not dispute its reliability. I only disputed that it teaches us anything about the origin of these acids. We have always to take into consideration that the cavity of a decaying tooth receives food supply from without—sugar, starch, etc. These, if fermented in the teeth, will produce acids. These acids may help in the destruction of teeth, and by combining with a part of lime, produce—as Dr. Niles once stated to me on a former occasion—acid phosphate of lime. But the acid phosphate of lime can never decompose the normal phosphate.

But how do starch and sugar ferment? *Has Dr. Niles the very least evidence of this fermentation being possible without lower organisms?* Not one authority yet has been found that could prove that starch can be *fermented* into lactic acid without the presence of germs.

Gentlemen, the "bugs" are here again. You may try to throw them out by window and door. They are at it again!

Dr. Niles simply seems to me to amplify the Germ Theory by showing some details.

Those gentlemen who are often referred to as the defenders of the Germ Theory, some of them connected with the *New England Journal*, as far as I know, have only put up the proposition to be proved or disproved, viz: *Germs are the essential factors of decay.* The *detail* of their action, as we have often insisted upon, we do not

know. Dr. Niles has furnished valuable points by showing that fermentation and putrefaction together will destroy teeth and produce caries. But he seems to me to be wofully at loggerhead about the *difference* between fermentation and putrefaction. The difference is clean and clear: fermentation is the change of non-nitrogeneous substances into other non-nitrogeneous substances *by the presence and action of lower organism,* called germs or ferments; putrefaction is the change of albuminous substances into other, generally offensive, combinations *by the action of lower organisms.*

If we have a mixture of non-nitrogeneous and albuminous substances, e. g., sugar and meat, first fermentation sets in, and only after all the sugar has been transformed into acids, etc., putrefaction begins. If we now supply fresh sugar, etc., both processes go on at the same time. The same seems to me to be the case in teeth. The food supply from without may undergo fermentation while the tooth substance undergoes putrefaction; one will aid the other by furnishing a more varied bill of fare to germs. But what we insist on is *that none of these processes would take place without the presence of germs.* I think this point is very clear. Dr. Niles certainly does not wish to have that experiment with the fluid which he kept alkaline and found that no destruction of the tooth substance took place, to be taken seriously; he is too good a chemist for that. How did you keep the fluid alkaline or neutral?

Dr. Niles: By carbonate of potash and ammonia.

Prof. Mayr: Dr. Niles is too good a chemist not to know that a solution which contains an excess of carbonate of potassia cannot possibly contain in solution any lime-salts. Therefore his triumphant conclusion, "You will find no lime-salts in that liquid," would seem to me rather to be intended for sophistry than for any serious argument. He supposed that you would not know the chemical point, but I think he was mistaken.

How often has the reaction of putrefying and fermenting liquids to be stated? A liquid that is purely putrefying is *always alkaline.* A liquid that is fermenting, is *acid.* We may get mixtures of the two, and then the reaction will be a mixture; but we have to state that in our words, otherwise they would become inexact.

Dr. Niles: Prof. Mayr claims that hardness has nothing whatever to do with the presence of lime-salts. I claim it has, by the analysis of five recognized authorities. He further says there is no decay without germs. We admit that the germs are there, but Magitot, in his

work translated by Prof. Chandler, says: "Acids are produced by fermentation and putrefaction of organic substances, and that they are what he calls the exciting action of decay." That is the point we wish to make.

Dr. Stockwell: The father of the Germ Theory, Dr. F. Y. Clark, is here. It might be interesting to hear from him.

Dr. F. Y. Clark: I have just got in and feel a little weary, but I should like very much if you will give me a little time—I hope the subject will come up to-morrow—to go into the histology and prophylactic treatment of caries, and should like to correct a few mistakes of Dr. Niles.

Dr. Werner: I would like to ask a question. If food containing sugar is so important to the development of acids and micro-organisms, why do people who apparently eat most sugar, like the Negroes in the South and the Esquimaux in the North, have less decay than we, and why have our intellectual prodigals, nervously active but physically degenerated, so much decay?

Dr. Codman relates some experiments that he made with teeth that he put into a solution of molasses and sugar, and sugar alone, and, after four or five months he found them very much softened, in a condition very much resembling decay. The teeth could be bent back, still retaining all their form. I showed them to some gentlemen, and it seems to me that it was a similar process to that producing decay.

Dr. Brackett: I saw the teeth after they were dried, but the point usually is, whether it is the pure sugar which produces the effect or whether the sugar has undergone fermentation. My guess would be, it first developed an acid, and that this produced the effect rather than the sugar.

Dr. Searle: I would like to ask Dr. Codman what the result was in the case with the granulated sugar?

Dr. Codman: The tooth in the granulated sugar was also softened, but not nearly so much as the other.

Mr. McDougal: Was the condition of the liquid neutral or not?

Dr. Codman: Making very simple experiments, I did not test it.

Dr. Clark: If Dr. Codman had examined his specimens with a microscope, he would have found myriads of bacterium termo.

After a short discussion on these experiments, the subject was dropped.

Dr. Chandler: Reference was made to Magitot. I should like to say that the first edition of the translation of Magitot's work is not yet sold. I would advise somebody to buy and read it.

Dr. Werner: I think that these gentlemen are entirely mistaken. I do not think that acids alone, or germs alone, produce decay. That seems to me a pretty far-fetched hypothesis. Why should germs eat away the tooth? They are very harmless; they do not hurt much anybody; but when you bottle them up, as was done by Dr. Codman, in sugar, then you get action. I am not afraid if an acid solution comes on my teeth so long as my glands secrete saliva that will protect them. And as for the micro-organisms, I am not a bit afraid of them. I think you pay too much attention to those things. You must look at the physical conditions; you must look at the nervous conditions; the mental activity. It is the excessive indulgence in nervous occupations, in things concerning the nerves and not the muscles, the sitting in crowded rooms and studying, that makes children's teeth decay. I come back to the question, Why do Negroes in the South, eating much sugar, and the Esquimaux, not have so much decay as we do?

Dr. Bartholomew: I would like to have another question answered. I had a patient who had the malaria very badly; that patient's teeth were in an excellent condition at the time she was taken down. She was sick about five weeks, and during that time her teeth became decayed—not around the roots next to the gums, but on that portion where the teeth had been filled; decay had started, and nearly every filling became loose. I got the prescription the doctor had given; it was quinine, with sulphuric acid to act as a solvent; that was the medicine taken and that the effect produced.

Prof. Mayr: To answer Dr. Werner, I would say that I question the logic implied in his statement of the sugar-eating Negro. It can be shown that the teeth of the two nations eating most sugar—the Americans and the Swiss, show almost in proportion the most decay. That is at least true of the Swiss, who have the worst teeth I ever saw. Also, people who eat but little sugar have occasionally very bad teeth, like those in the eastern provinces of Prussia, while the Russians have most excellent teeth. There is no doubt that the mental condition has something to do with the growth and spread of decay, but only by changing the internal resistance. We have not yet made out which exact factor of internal resistance is changed. In the case of Dr. Bartholomew, it seems to me that the acid destroyed the prominent edges of the teeth around the fillings, and thereby furnished a new point of attack to lower organisms. Here the acid may be said to be the primary cause of the trouble, but without the further

action of germs, we only would have had abrasion, and no decay. Another statement perhaps of interest I would like to make: I went with Prof. Putnam, of Cambridge, to what are supposed to be Indian graves along the Connecticut river; we found some skeletons, and a lower jaw with most of the teeth in it, but at least nine teeth showed plainly decay, showing that those races who were probably not worried much with over-study or sugar eating, had the same process going on in their mouths as we.

Dr. NILES thinks that those teeth ought to have been eaten away entirely by germs, together with the rest of the body.

Dr. F. Y. CLARK: I would say I cannot remain quiet when such nonsense is spoken. We all know that germs require moisture. When teeth are extracted and put on our shelves or laid aside, the meshwork of the teeth dries up, or, in other words, the bioplasson has ceased to become proper food for the organisms. The same was the case in the Indian skulls; the bioplasson was changed, and there was no further inducement for germs; that is the whole cause of decay not progressing there.

Dr. NILES: During the early stages of putrefaction was there not a great deal of moisture about the bones?

Dr. F. Y. CLARK: Yes, but if you try the experiments out of the mouth, you get unnatural conditions; the experiments in the mouth would be entirely different. If we try experiments upon teeth out of the mouth, we arrive at nothing. The living portion of the tooth is changed very much by its removal. If we could magnify enough a whole tooth, we would see it a perfect mass of meshwork; in this is the fluid which we call protoplasm, and that is what the germs are after. Dr. Miller has shown conclusively that they work way up into this meshwork. They do not "*eat*," because they have no mouths; they are plants, not animals, and they live by absorption; they absorb protoplasm and the lime is disintegrated; that is the whole thing.

Prof. ANDREWS: I would suggest that you take a look at the thirteen thousand skulls in the Cambridge collection. In those skulls of the Mexicans and Peruvians, you would be somewhat surprised to see how much decay there is. Many of the Peruvians have defective teeth. A great many of the early mound builders had them too; only those of the Sandwich Islands are free from decay.

Adjourned.

HARVARD ODONTOLOGICAL SOCIETY.

[An abbreviated report of a late meeting. Published by request.]

Subject for the evening—FLUIDS OF THE MOUTH.

Prof. CHAS. MAYR: When I was invited by your Executive Committee to give a lecture before this society on the fluids of the mouth, I found it a very agreeable subject for me. If I had my own choice, I would probably have taken no other subject.

We can bring the fluids of the mouth into three classes: Normal fluids, Normal fluids in a state of disease, and fluids brought into the mouth from without.

The most important of the first is saliva. All of you are familiar with this secretion, but perhaps you have not all directed your attention to the point that there is a difference in the secretion of the three salivary glands—the parotid, sublingual and submaxillary.

The secretion of the parotid glands is the most voluminous. According to experiments of Lehman, about seven-tenths of all the saliva secreted is derived from these glands, two-tenths come from the submaxillary, and one-tenth from the sublingual. Compared with the great amount of the secretion of the parotid gland, there goes a greater dilution, while the secretion of the sublingual gland is very much more concentrated.

The specific power of saliva to convert starch into sugar is due to the principle *ptyaline*, which is secreted in largest amount by the sublingual gland. Besides ptyaline, saliva contains a large amount of salts, of mucus and of epithelial shreds.

Those who have studied the origin of tartar on the teeth seem to be forced to attribute the formation of the lime-salts to the saliva; but I am not at all prepared either to defend or to attack the theory, because I have not yet studied it, and know nothing about it.

The other liquids of the mouth, like mucus, etc., have not been separated enough by chemists to allow of their being treated with exactness.

The second class of liquids we have to consider are normal ones in a state of disease.

You are familiar with ptyalism or salivation produced by the use of mercurial drugs.

During this affection, the amount of ptyaline in saliva is not increased; but the total quantity of saliva is very much increased.

Saliva has an invariable, neutral or alkaline reaction. I think that only once I could observe an acid secretion from the submaxillary gland; but the case is doubtful.

Saliva, when fermenting or decaying, becomes very offensive.

To what is this offensiveness due? You have read of the famous experiment of Prof. Liebig, of Munich, who produced this offensive odor artificially. He heated meat, bread, and similar substances, with caustic potash to a certain degree of heat; dissolved them in water, added a strong acid, and liberated the organic acids which have that odor of putrid substances. From this experiment, we can say that the putrid odor is due to some product of imperfect oxidization.

If you let saliva stand in glass, exposed to the air, after a short time it will become of a strongly alkaline reaction and a very offensive odor.

The third class of liquids are those introduced into the mouth from without. This leads me to another subject, little touched by essayist, and that is the sense of taste.

What is taste, and what kinds of taste may we distinguish? It seems to me that there are three pairs of tastes opposite to each other—the alkaline and acid, sweet and salt, bitter and metallic. It is strange that our taste universally refuses alkaline food. If we except the few cases of people eating half decayed fish, or mush of Indian meal with saleratus forming a kind of soap, etc., all our food is prepared to suit acid, sweet, salty and bitter tastes. Probably since millions of years our ancestors have become used to prefer acid food to alkaline or any other, and we cannot doubt that our teeth and all our organs have adapted themselves to this want. How can teeth adapt themselves to acids?

You are all familiar with the fact that any acid will dissolve tooth substance. The only way in which the tooth can protect itself is by supplying the loss.

The question of the teeth being endowed with nutrition is very much disputed.

Galen, the old Roman doctor, maintained that teeth have a circulation and a supply, but almost universally dentists now-a-days do not accept the same theory. This seems to me perhaps erroneous. It is true, the fact of a supply has to be proved, but I simply put up a hypothesis either to be proved or disproved.

As long as we know nothing exact about the circulation of a tooth, we cannot say anything definite about supply or non-supply.

I tried a few experiments in that direction. I rinsed my mouth carefully and tested with oxalic acid. The last rinsing-water I used showed no lime-salts present. I then took some chemically pure

acetic acid and water, mixed them to give about strength of common vinegar, assuring myself that no lime-salts were in it, and rinsed my mouth with this liquid. By testing it afterward I found a considerable amount of lime-salts dissolved.

By some experiments which were made some years ago, I found that a tooth was completely dissolved in vinegar in the space of one week. If we calculate this up to the average time which a man is likely to keep sour food in his mouth, we would find that the teeth of a German, who eats the most sour food of any nation I know of, like sauer-kraut, pickles, sour roast beef, sour game, etc.; drinks sour wine and sour wheys and beer, would be completely dissolved in seven or eight years. But nothing of that kind takes place. They are rather stronger than those of the Americans, who eat but little sour.

As to the acid introduced into the mouth, the most common one is acetic acid or vinegar. Very common is also malic acid, the acid in apples, tomatoes, currants and gooseberries, citric acid in lemons and oranges, lactic acid in sour milk, butyric acid in butter, and few rare fruits, like bananas. All these acids form soluble salts with the lime-salts in teeth. Oxalic acid in rhubarb, etc., forms insoluble salts, it is true, but it destroys the teeth nevertheless. As to the influence of acids on the decay of teeth, you know my opinion, and I will leave anything in that line to be brought out by the discussion.

Dr. Hitchcock: If I am not mistaken, Prof. Mayr stated that albuminous substances, in decaying, always give alkaline products. I wish to relate an experiment relative to that point. I let some saliva stand in a glass, and tested it continually, and found it acid until I had to throw it away because of its offensiveness.

Prof. Mayr: That is a very important point. If you expose fresh saliva to the action of the germs in the air, you first get a fermentation of the mucus and different non-nitrogeneous substances in the saliva; but after this fermentation has passed away, real putrefaction commences. As I have repeatedly stated, the difference between fermentation and putrefaction is that fermentation is the change of organic non-nitrogeneous substances into other organic non-nitrogeneous substances by the presence of lower organism. Putrefaction is the change of albuminous substances into offensive products by the presence of lower organisms. During fermentation, the reaction is acid; but, during putrefaction, it is alkaline.

I do not blame the Dr. that he threw away the saliva after it had commenced to give offensive odors. Here putrefaction commenced.

The specific power of the parotid gland is very weak. Every one of you can make the experiment without any difficulty. He will find that starch and saliva of the parotid glands will have become putrid before it will show decided signs of the formation of sugar. On the other hand, the secretion of the sublingual gland is most powerful in bringing about this result. In our experiments, we find besides, that raw, unboiled starch is transformed into sugar with considerable difficulty; but if boiled starch be mixed with a very small amount of mixed saliva, chemical tests will show the formation of sugar in a very few minutes.

Dr. MERIAM, Salem, Mass., draws attention to the observations made that tincture of iodine painted on a normal tooth will stick to it; but if the tooth has been scoured, it will not more adhere.

He thinks that there exists some kind of protective layer all over the surface of the tooth.

Prof. MAYR thinks there is something worth noting in the suggestion.

Dr. WHITTEN asks how we have to explain the fact that dead teeth are not dissolved in the mouth by the continuous use of acids, if the teeth, according to Prof. Mayr's description, are only protected against destruction by a continual supply of lime-salts.

Prof. MAYR thinks that the history of the development of the teeth shows that the enamel is independent from the dentine, at least in a great measure, and that it is very well possible that the dentine be dead and the enamel alive. What we call dead teeth are generally teeth with dead dentine; but the enamel, with a circulation of its own, must remain alive some time after the dentine has died. We must never forget that the enamel is a surface organ, and that its minute microscopical structure is certainly arranged with reference to outside influences. We do not yet understand the detail, but we cannot doubt that there is such a connection between ends and means.

Dr. NILES, referring to the experment of Prof. Mayr, which was to the effect that acids at the very moment of application to teeth immediately dissolve the tooth substance, suggests that lime-salts may have been derived from the saliva which would be abundantly secreted under the conditions of the experiment, etc.

The eighteenth annual session of the Maine Dental Society will be held in Portland, Tuesday and Wednesday, July 17 and 18, 1883.

DANA W. FELLOWS, *Secretary.*

NOTICE TO STATE BOARDS OF DENTAL EXAMINERS.

There will be held at the Cataract House, Niagara Falls, on Monday, August 6, 1883, at 2 o'clock P. M., a meeting of the various State Boards of Dental Examiners, for the purpose of perfecting the organization of a National Association of State Boards. It is hoped that every Board will be fully represented.

GEO. H. CUSHING,
Sec'y of Conference held at Lexington, Ky.

NOTE TO MEMBERS OF THE CONN. VALLEY DENTAL SOCIETY.

The meeting of the American Dental Association will be held this year at Niagara Falls, commencing August 7, and it is desirable that we should be well represented.

The meetings are always well worth attending, as they are the means of bringing together leading members of the profession from all parts of the country. The place, also, is one which every American, at least, must desire at some time to visit.

Go and take your wife with you, and if you haven't one, get one.

We are entitled to some twenty-five delegates. Credentials will be furnished on application to Dr. A. M. Ross, Chicopee, Mass.

N. MORGAN, *President.*

THE AMERICAN DENTAL ASSOCIATION will meet at Niagara Falls, the first Tuesday in August, at 10 A. M.

The Committee on Credentials, and the Treasurer, will be at the place of meeting at 8 A. M. Tuesday, at which time it is hoped that members and delegates will present their credentials and pay their dues before the hour for the regular meeting.

The afternoon of Tuesday will be set apart for the meeting of the different sections, to enable them to complete their reports to be presented to the general association.

J. N. CROUSE,
Chairman Executive Committee.

THE AMERICAN DENTAL CONVENTION will hold its meeting for 1883 at Saratoga Springs, N. Y., commencing on the second Tuesday in August, and to continue for three days.

A large attendance is expected, and several interesting papers are already promised by prominent men in the profession.

Programmes, etc., will soon be issued. In the meantime, particulars may be obtained by addressing the President, Dr. F. Y. Clark, or Dr. A. C. Rich, Secretary, Saratoga.

SELECTIONS.

A NEW AID TO DIAGNOSIS.

Some of our readers may perhaps have noticed, in a paragraph published by the *British Medical Journal* upon the death of Dr. Beard of New York—who, it may be remembered, spoke at one of the meetings of our Section at the International Medical Congress in support of the views of his friend, Dr. Norman Kingsley—the surprising statement that at first his fatal illness had been attributed to the presence of an amalgam filling in one of his teeth. The tooth was extracted, but he did not rally, and died after a few days of pneumonia—a disease which it is not usually impossible to diagnose at a tolerably early stage. A full report of the case is not before us, but as it is not the first, and it may be feared will not be the last, instance in which an amalgam monomaniac will air his pet theory, it may be worth while to prick the bubble before it has soared too far.

In the pseudo-scientific writings of some of our transatlantic friends—for happily this particular aberration has its home for the most part across the sea—blindness, headache, insomnia, loss of flesh, vertigo, neurasthenia, diarrhœa, constipation, the milder forms of mental disturbance, and the degeneration of civilized man, have all been attributed to the curse of amalgam fillings. What is most surprising is that those affected—the monomaniacs, not the owners of the amalgam fillings—do not meet with a case now and then, they reckon them by hosts; and what is more, they cure the tissue degenerations, which may often from the symptoms be fairly inferred to have taken place, in the twinkling of an eye by the removal of the base material and the substitution of lengthy gold fillings, at no small profit—to the patient. They are fond of rushing into print, but here they are less successful, for they give so little reason for the faith that is in them that the unbelievers have an unjustifiable habit of refuting their conclusions out of their own mouths, and relentlessly showing from internal evidence how little credence need be given to their statements. This, however, is the common lot of all reformers. Still, so far, the unbelievers have had the best of it, for a single well-observed and well-recorded observation of constitutional damage from this cause has yet to appear.

But with such we must not confound bright exceptions like Dr. Talbot, who, calling to their aid the resources of physics and of chemistry, experiment with all the accuracy that these sciences afford. The

delicacy of the methods employed is beautifully illustrated in an experiment in which he administered to a dog a dose (homœopathic) of mercurius vivus, of known but considerable dilution, and then found by the aid of a powerful microscope globules of real metallic mercury in the blood. Had we only the necessary data, a very interesting calculation might have been made with reference to this experiment, but we are debarred from working out our sum, since we are not told what was the weight of the dog, the probable amount of blood in its body, the amount examined in the field, the proportion of mercurial globules to blood corpuscles, etc., etc.; and this is unfortunate since in the absence of this information the sceptical mind might be apt to fancy that the dose of mercurius vivus must have been rather like the widow's cruse of oil.

If this sort of writing, and of argument, is to be tolerated, it will soon come to pass that the medical adviser, unable to refer a difficult case to the convenient and comprehensive heads of gout or syphilis, will look into the mouth, joyfully hail the sight of an amalgam filling, and look no further for the source of his patient's woes. But there may be a brighter side to this. Mercury is an anti-syphilitic, and in properly selected cases an amalgam filling may be productive of absolute benefit. Our homœopathic friends will find an amalgam filling of given weight, worn for a given number of days, an elegant method of exhibiting the drug. At all events we freely present them with the idea, whatever it may be worth.—*The Journal of the British Dental Association.*

"Thou hast embarked, thou hast made the voyage, thou art come to shore; get out."—*Antoninus.*

"As the child is born or comes into life by leaving the womb, so the soul may, on leaving the body, pass into another existence which is perfect."—*Antoninus.*

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ORIGINAL COMMUNICATIONS.

FURTHER CONTRIBUTIONS ON THE SUBJECT OF DENTAL CARIES.

BY W. D. MILLER, BERLIN.

[Read at the Union Meeting at Springfield, June, 1883, by Dr. W. C. Barrett.*]

I. CARIES OF ENAMEL.

Up to the present time, investigations concerning the parasitic nature of dental caries have been confined chiefly, we may almost say exclusively, to a study of its phenomena as seen in connection with carious dentine; but as at least nine-tenths of all the cases of caries which come under our treatment necessarily begin with enamel, the value of careful observations on the caries of that tissue cannot well be overestimated.

The difficulties attending the preparation of slides of carious enamel are vastly greater than in those of dentine, because in the former the tissue becomes so frail that it falls to pieces during the process of grinding, while the method of treating carious enamel with acids and making razor sections, would hardly be adapted to a study either of the chemical or parasitical character of the carious process.

I have nevertheless succeeded in obtaining one hundred and fifty

*Reprint from *Independent Practitioner.*

microscopic preparations of carious enamel, from over one hundred and twenty-five different teeth. These sections were all stained with some aniline dye, and mounted in Canada balsam. Neither enamel nor dentine in a healthy state can (with the exception mentioned under V) be stained with any of the aniline dyes of which I have made use. On the other hand, both enamel and dentine which have been acted upon by acids, may be readily colored.

This fact often furnishes a very valuable and sometimes the only indication as to whether any change in the structure or composition of the enamel has taken place.

In the beginning of the carious process we find on the surface of the enamel a slight depression, or concavity, which may or may not contain Leptothrix buccalis in considerable masses. The border of the enamel will be slightly tinted with the coloring matter used in staining; beyond this, to the depth of perhaps fifty micrometers, the enamel will almost always be very perceptibly discolored, as though acted upon by some agent, producing effects undistinguishable from those of acids.

In such preparations we must search a long while before we find anything which in any degree justifies the conclusion that the caries is entirely and solely dependent upon the presence of fungi.

In one case, where a considerable portion of the whole periphery seemed to be more or less carious, appearing in various places uneven, and discolored by the dye which had been absorbed, I saw some of the spaces between the enamel prisms apparently distended and filled with something which looked like micrococci. As this something had not been stained at all, the case was rather doubtful.

In another instance, where the enamel was discolored to the depth of about one hundred and fifty micrometers in such a manner as to leave no doubt that a change had taken place, I saw very delicate funnel-shaped excavations extending into the enamel for about ten to twenty micrometers, and apparently containing micrococci. With one or two other exceptions of like nature, I have not found in any of my preparations of this class a single instance where even the interstices of the enamel prisms had been penetrated by micro-organisms.

In a second class of preparations, we find the enamel entirely destroyed for a certain space, and the caries encroaching upon the dentine. As soon as the enamel is broken through, the caries extends rapidly in a direction at right angles to the dentinal tubules as well as

parallel with them. Here is a very marked distinction between the action of the agent which produces the softening of the dentine and that of the fungi; for while the former appears to advance with about the same rapidity in all directions, the latter travel very slowly in any course excepting one parallel with the tubules, since they can escape from one tubule to another only through the very narrow and tortuous branches of the tubuli.

This conclusion is fully confirmed by an examination of instances like that cited above, where that part of the softened dentine which is still protected by enamel will be found to contain very few fungi, or none at all.

The walls of enamel on each side of the cavity frequently show a marked discoloration (brownish yellow) extending to a depth varying from a few micrometers to one-fourth of a millimeter; in other cases, an equally broad zone is seen to be distinctly stained by the dye used in preparing the specimen. In such instances, the paucity of the micro-organisms is often so great that one must search very carefully to find even a few lying along the margin or in the fissures of the enamel. Within the enamel itself they do not appear to be present, and a regular advance of the invading organisms beyond or up to the boundary between normal and diseased enamel, seems to be entirely out of the question.

As one result of my study of caries of the enamel, I have been led to the belief that after the enamel has once been broken through and a cavity of decay formed, the destruction of the remaining walls of enamel takes place chiefly from within outwards, rather than from without inwards.

This, which we may call the internal caries of enamel, is somewhat less difficult of examination than the caries of the external surface.

Take for example a molar tooth, extensively decayed on the grinding surface; slightly enlarge the opening in the enamel, and it will be found that the bond of union between the dentine and enamel has in some places been ruptured. Remove as much as possible of the softened dentine with one stroke of a spoon-shaped excavator, and the surface of the enamel will, to a greater or less extent (depending upon how far the caries has progressed), be seen to be covered with a layer of white, amorphous powder, exactly resembling both macro- and microscopically, that which is formed on the surface of a piece of enamel which has been for some time immersed in acid, or in a mixture of saliva and bread.

Examined microscopically, it will be found to consist of enamel prisms either single or in bundles, of from ten to one hundred and fifty micrometers in length. This powder is sometimes half a millimeter in thickness. Remove the surface of the outer layer, repeatedly purifying the instrument by fire, and using the most scrupulous care to avoid bringing any kind of impurity in contact with the deeper parts; take then a portion of the powder lying on the border of the healthy enamel, stain and mount it in Canada balsam, and you will be astonished to find that there is not only an almost complete absence of micro-organisms where you might have expected to see them in great numbers, but that the enamel is also entirely free from any signs of infection, either between or within the prisms.

In one preparation, by diligently searching for three minutes, I found one bacillus and two bacteria; in another, I hunted for five minutes before I found a single organism. Microscopic sections ground from enamel decaying on its inner surface frequently show, by the readiness with which they take up the dye, that the enamel, to the extent of one-half m. m. or more has undergone a softening process. But we look in vain for a corresponding invasion of the fungi. The dental fibrils on entering the enamel often become very much expanded, forming oval or spindle-shaped excavations in the substance of the enamel. If the caries of enamel proceeds from within, these cavities readily become filled with fungi, and the zealous seeker after these organisms would no doubt at once jump to the conclusion that they had eaten a hole in the enamel.

I have one preparation of carious enamel in which a very limited number of micrococci appear to have worked their way between the enamel prisms along the course of the enamel fibers, a fact which, however, signifies very little, as I have shown in a previous number of this journal. As a summing up of what has been said, I will state that from a careful study of over one hundred and fifty preparations, I am driven to the conclusion that there is as yet no sufficient ground for the assumption that micro-organisms play any more than an unimportant part in the caries of enamel.

II. CARIES OF CEMENT.

The comparative infrequency of caries of cement compared with that of dentine or enamel, the consequent difficulty of obtaining suitable material for examination, the fact that normal as well as diseased cement becomes to some extent tinged by the aniline dies, and

the absence of any characteristic form in which caries of cement presents itself, combine to make this tissue far more difficult of examination than either the enamel or dentine.

Although I have more than thirty specimens of caries cementum, I have not been able to arrive at an opinion sufficiently conclusive for presentation here. I therefore leave this subject for the present, with the remark that I am not now prepared to present any proofs in favor of a pure parasitic caries of cement.

III. CARIES OF DENTINE AT NECK OF TOOTH.

The outermost layer of dentine at the neck of the tooth is either normally without tubuli, or they are so fine as not to furnish so easy an entrance to micro-organisms as the tubuli of dentine in general. We therefore find in this region caries manifesting itself in a form somewhat different from that presented by dentine in other positions. It is, moreover, here alone that we may readily obtain specimens of caries of dentine in its incipient stages.

A specimen of this kind, examined under the microscope, usually shows on the outer border a zone consisting of indistinguishable masses of fungi, from which project numerous threads of Leptothrix buccalis. Below this comes a zone of infected dentine, which is seen to be traversed by numerous triangular cracks or fissures, having their bases at the periphery, and apices at some point beneath the surface of the dentine; in other words, the section appears as though it had been notched by a triangular file. These notches are almost invariably found to be filled with fungi, chiefly micrococci. Whether these fissures were produced by the fungi, or whether they resulted from a contraction of the outer layers of the softened dentine, or from some other cause, and afterwards became filled with the fungi, remains to be determined.

Below this zone of what we may call infected dentine, comes a zone of softened, non-infected dentine. Sometimes this is of considerable depth, while in other instances the fissures appear to extend almost if not quite up to the boundary of the normal dentine. In some cases, the transition from the softened to the normal dentine is so gradual that it is very difficult to say just where the boundary lies. In a great many, however, it is so abrupt that one may mark the limit with the greatest ease, a zone of deeply stained dentine being immediately followed by one of perfectly colorless tissue, so that one may draw a curved line through the preparation, and say, On one side is normal; on the other, softened dentine.

This applies not only to that at the neck of a tooth, but to dentine in general, and is a fact hard to reconcile with the germ theory of caries, since in all the preparations which I have examined with reference to this question, I have met with very few cases where the boundary line between the infected and non-infected parts is not of the most tortuous and angular nature conceivable.

IV. CARIES OF DENTINE.

To what I have already written upon this subject in the January number of the *Dental Cosmos* and in the May number of the *Independent Practitioner*, the following may be added: I have made some hundreds of sections of carious dentine, and over two hundred I have treated with various reagents and mounted in Canada balsam. These preparations (unless made from dentine in the last stage of decay) invariably show tracts varying from a small fraction up to one-half of the whole section, which are almost, and sometimes completely, free from micro-organisms. Viewed in this light alone, the idea that softening of the dentine is produced by fungi penetrating the normal dentine and first consuming the organic part, appears to be doubly wrong—first, because the fungi which should have consumed the organic portion are not there; and, second, because the organic matter which should have been consumed is still present, or at most, has suffered less than the inorganic portion.

The same fact may be exemplified in the following manner: Thoroughly cleanse the cavity of a freshly extracted carious tooth in which the pulp is not exposed, remove the softened dentine, repeatedly changing the instrument used for one purified in the flame of a spirit lamp or bunsen-burner, until you have come to the boundary between soft and normal dentine. Then with a spoon-shaped excavator remove a quantity of fine shavings or scrapings of this dentine just on the border, stain and mount in Canada balsam. If the operation has been carefully and cleanly performed but very seldom will any of these shavings contain fungi.

A question in practice is suggested by the following case: A patient comes with a tooth containing a large amalgam or gold filling, made five, ten or more years ago. The filling was inserted over a living pulp, which afterward died, or as frequently happens in Germany, over a dead pulp. An abscess followed and a fistula was formed which has been active at intervals throughout the whole period of ten or more years. During all this time there was probably not a moment

when a microscopic examination of the contents of the root-canals would not have revealed great numbers of fungi under conditions of moisture and temperature very favorable to their development. When, therefore, we remove the filling and find no signs of caries in the root, we wonder what those organisms have been doing all these years if, as it is asserted, they are capable of devastating whole rows of teeth, and undermining the best made fillings in the space of a few months. Evidently there is a limit, and we may say with confidence that not all fungi are sufficient to destroy teeth. This is not an imaginary case, but one which I have met with time and again, and one which I think every practitioner must now and then encounter.

V. PARASITES IN NON-CARIOUS TEETH.

Under this heading I wish to call attention to certain forms met with in the tubuli of perfectly healthy dentine, which may lead us to diagnose fungi when there may be none present. Examining a section of molar tooth in which the cavity of decay was separated from the pulp by a layer of dentine one-half a $^{c. m.}$ thick, I found on the side of the pulp cavity farthest from the decay, within the dentinal tubuli, something which presented every appearance of micrococci, bacteria and bacilli. Had these tubules been on the side of the pulp cavity, presenting the decay, I should not have hesitated a moment to put them down as such. Under higher powers, however (zeiss $\frac{1}{18}$ oil), the micrococci appeared to have an uneven, irregular contour, while the bacteria and bacilli instead of having roundish ends, sometimes appeared pointed, or as if cut across diagonally, and in some instances I saw shapes which did not correspond with any form of fungus that I have ever seen. The tooth from which the section was taken contained a living, healthy pulp. The part of the section containing the fungus-like forms was slightly stained by the dye, the intensity of the color being greatest near the pulp cavity and extending in some places quite to the periphery of the dentine.

Since that time, in nearly every section of sound dentine, from perfectly sound teeth which I have examined with reference to this question, I have found similar figures, especially the coccus-like form. If these are really fungi, we need no farther proof of their harmlessness than the fact that such sections show no evidence of caries whatever. If, on the other hand, they are not fungi, we are in continual danger of setting down as such things which are of an entirely different nature.

H. Morgenstern, dentist, of Berlin, described at the last meeting of the Central Verein deutscher Zahnarzte, certain forms which he had found in senile teeth, or such as had become loose from absorption of the alveolus. He believes that he has found either fungi or algæ in such teeth. Whether these are the same as the forms above described I cannot say. It is significant that he finds them in that class of teeth which is least of all subject to caries.

The case teaches us that it may not be allowable to set down as fungus every little round or oblong thing which we see in a slide.

The points in this communication to which particular attention is directed may be summed up as follows:

(1.) Aniline dyes react upon enamel which is attacked by caries in the same manner as upon enamel softened by acid. A participation of fungi in the first stage of the carious process is not observable, although a slight invasion of the diseased enamel appears in some instances to have taken place.

(2.) Caries of enamel, advancing from the inner surface, reduces the tissue to a fine white powder; sections of such enamel usually show micro-organisms only in the parts where the tissue is completely broken down, while with a proper amount of cleanliness, considerable quantities of the powder may be obtained which is completely free from fungi.

(3.) Softened dentine taken from the surface of the normal dentine appears as a rule quite free from infection.

4.) The softening of the dentine advances with almost equal rapidity in all directions, while the invasion of fungi goes on much more rapidly in the direction of the canaliculi.

(5.) The boundary between the normal and softened portions of dentine is often perfectly distinct and sharp; it is impossible, on the other hand, to draw the boundary line between the infected and non-infected portions.

(6.) The mere presence in the canaliculi of something which resembles, or even actually is, a fungus, is not proof that the thing in question is a cause of caries.

In conclusion, it may be said that the germ theory as tested by the microscope, apparently falls short of furnishing complete explanation of the phenomena of dental caries; that fungi, even when reinforced by acids, do not in all cases prove themselves sufficient for tooth disorganization.

There appears, in many cases at least, to be some other element at

work. Investigations in the direction indicated by Prof. Pierce in the *Dental Cosmos* for March, or by Prof. Abbott, ought to throw some light upon this point.*

NECESSARY FOUNDATIONS FOR THEORIES IN DENTISTRY.

BY CHAS. MAYR, A. M., B. S., SPRINGFIELD, MASS.

[Read at the Union Meeting of the Massachusetts and Connecticut Valley Dental Societies, held at Springfield, June, 1883.]

I expect there are but few among you who have not become convinced that dental theories are much more than mere playthings; that, without them, one is adrift on the ocean of guessing; and no matter if one adheres to a right or wrong theory, as long as one has enough of a theory as a guide to shape one's course, every one feels a kind of satisfaction in the profession—a love and zeal in it. Without theories and speculation, the profession would be a dreary waste of money-making devices.

I have been at many meetings, but, gentlemen, it is my conviction that no class of professionals show such a zeal in the study of their special branch—we may except perhaps the opthalmologists—as the dentists.

Not long ago I met a doctor who said he did not believe in dentists! From the drift of the discussion, I had to infer he did not believe that they had any thought except that of drawing teeth, plugging holes and pocketing the money. I felt a great deal of satisfaction in showing him that his particular branch of medicine was much less studied and worked out, and based on scientific principles, than dentistry. It is true, if dentistry consisted in nothing but mechanical work, dentists could not claim any more consideration than other nice mechanical workers, like jewelers, glass-polishers, electroplaters, etc.; but just their love for real knowledge, their ardor in the investigation of the whys and hows, have raised them to a standard which makes doctors jealous—fortunately only the ignorant ones. I think that there is no class of men—perhaps excepting the reverends—where cheek and imposition plays such an important part of the professional skill as among the physicians. There is a great body of as conscientious men as can be found the world over among the physicians, but there is a body almost as great whose whole stock in trade are a few

*The second paper presented to this meeting by Dr. Miller, and read by Dr. Barrett, may be found, substantially as read at this meeting, in the July number of the *Cosmos*.—Ed.

Latin words, the capability of writing badly in bad Latin a prescription not intelligible to the laymen—and cheek, immense cheek.

But why do I give this introduction? Simply to show you what I consider the most important factors which will raise dentists and dentistry above the level of the mere mechanic: namely, theoretical knowledge, speculation, theories and a practice not based on rote, but on a certain more tangible basis than simply the advice of somebody else.

While we therefore may very well agree as to what will elevate the dental profession, as soon as we look over the field to observe how this works in detail, we meet with the most diversified and not always satisfactory results.

We do not realize enough how immense nature and how immense the amount of complexity is in such a little object as in a tooth. But a complete knowledge of all the details of a tooth is as essential to a complete theory as a knowledge of all the details in the course of a planet is to the problem of calculating its position for a hundred thousand years hence. The latter problem has been solved to satisfaction, but not to perfection; but, in regard to a tooth, we are still at a pitiable state of childhood in knowledge. Why that? Because we know so very little surely about the fundamental facts concerning a tooth. These facts we can group into three classes: anatomical facts, biological facts, physiological and chemical facts.

Anatomical facts: What do we know, and what do we not know? We know the grossly mechanical structure of a tooth; we know that it consists of enamel, of dentine, of a pulp, of blood vessels and nerve threads. If we advance further by means of the microscope, doubts begin already to gather. We know that the enamel consists of peculiar rods, that the dentine consists of canaliculi, that the pulp has on its surface "odontoblasts," as they are called. But, further, our knowledge becomes dimmer and dimmer as our magnifying power increases. We learn things only in a general way. We do not know the exact details of the arrangement of the canaliculi; the question of a communication between two canaliculi is hardly yet settled. The existence of living tissue in the canaliculi is still a matter of dispute; a little further, and we arrive at the border land of knowing and seeing. We know that the bioplasson threads extend through all the canaliculi of the tooth; but how are they constituted? Here we have arrived in Unknown-town. We do not know the detail of the structure of the tissue between the lime crystals; we do not know

the detail of the bioplasson threads; we know the whole structure of a tooth only in a story-telling way, but not in a scientific way. We will know it in a scientific way when we will be able to apply figures to all of these things.

If we knew of the planet Jupiter only the fact that he moves around the sun in a very complicated manner, that he seems to follow the course of an ellipse, but beyond that, we should not know anything, we could not say much about the probable position of Jupiter thousands of years hence. Just so in teeth. So long as we do not know the law of the canaliculi in an exact sense, so long as we do not know the law of the strength of the fibers in the canaliculi, we know but very vague things about the tooth. Further, the tooth has a pulp; the microscopy of the pulp has not yet gone beyond the gaze of the primitive man at the starry sky. All is still a kind of fabulous story of a man who has been in foreign countries.

If we listen to the microscopist, he tells us his discoveries like the first navigator who saw an island surrounded with coral reefs, another one that bore cocoanut trees and beasts as huge as mountains, etc.; but they did not know anything about size and exact positions, etc.

Thus the microscopist talking about the dental pulp, still is forced to tell us vague stories of connective tissues, afferent and efferent vessels, odontoblasts; but the exact detail of their structure is still totally unknown. We know that "connective tissue," as we call it, abounds everywhere; that a nerve twig goes to the brain, but we know nothing of the details of the nerve twig. Its course is only roughly anatomically known. We cannot follow it up in the brain, do not know its connection with the great sympathetic system, and know hardly anything about its existence.

You see the list of our not knowing vastly surpasses that of what we know, and as long as that is the case, it seems to me the duty of every dentist, who is a microscopist, to take a special subject which he will investigate with all his power. Say, one takes the structure of the enamel. How shall he proceed? It might perhaps be immodest to try to give advice, but it is not at all an advice; it is only a suggestion: Let the microscope be absolutely first-class; by former experience we know already that we want the very best defining power, with magnifying powers of at least one thousand diameters.

Second, how shall we treat the specimens? Now here I know I will meet with great opposition.

First of all, *let us not abuse our microscopical specimens.* We must

make preparations of the same enamel with the most different chemicals. We must make them under the most different methods of grinding and mounting, and then we will get a collection of chemistry of the enamel.

I have heard some microscopists say: "We do not want to look at lime-salts," and it was said in a tone which made it appear as if some really important and smart saying had been made. Gentlemen, he is an absolutely unscientific investigator who does not want to look at lime-salts; he is a playing child, but not an investigator.

The tooth is not canaliculi and bioplasson alone; it is also lime-salts. And if your razors do not cut the lime crystals, well, we will have to devise other methods of preparation; but by all means let us look at the lime-salts too. We want to see all. Only by thus specifying his work, a dentist will accomplish anything. He will have to make hundreds of preparations of enamel, first, to ascertain the effect of the different treatment; then, after he has arrived at certain results concerning the chemistry of the enamel, he will proceed to utilize his knowledge to bring out the details. He will begin with the apex of the crown; he will make a great number of sections from the same tooth, commencing at the crown and going down to the neck of the tooth; he will not reject one section. He thus will see the change in the enamel and the adjoining dentine. By this method we will obtain a clear knowledge of the details of the enamel. Perhaps his studies will lead him to the use of a microscope with three or five thousand magnifying powers. That is the way, I imagine, we have to get at the basis.

In chemistry it is being done, and will result in time with a theory of chemistry which will allow us to attack the bioplasson in the rear while the microscopist attacks it in front. The same thing will have to be done with the dentine, the pulp, the cementum, the germs, the alveolus, the nerve and its ending in the brain. Only then will we get the foundation on which we can build safely. But this is only the anatomy.

Next comes the *Biology*. What do we mean by that? It is the study of the development of the tooth; of the changes during the development; how the structure of the tooth stands in relation and connection with the structure of the same tooth in the mother and grandmother, in father and ancestors. We must know how circumstances have interfered and do interfere in this direction. The microscope will be our great guide. The biological point of view is in fact as immense as the anatomical point.

Next to it is the *Physiological* aspect, and this is as poor as the rest in regard to our present knowledge. We know nothing at all about the physiology of the tooth except that it has afferent and efferent vessels. We know certain conditions of its aching, but its nutrition, its supply, are wrapped in utter darkness. The physiology of its growth is far more unknown to us than the belts on Jupiter. Dental physiology is absolutely "naught" in all its meaning. We can only establish facts in physiology by specializing in the most refined manner our task. We must submit developing teeth to the most varied experiments; we must make the most divers preparations of teeth; we must study the effect of light, of heat, of mechanical irritants, of irritants applied at the brain on the development of the tooth, but all this must be done in a most scientific spirit.

I will not discourage you any longer with a list of what we would like to know. If the proverb of a fool asking more questions than ten wise men can answer, should be applied me, I am afraid Northampton would not prove big enough for me. But the pointing out of deficiencies is the first step toward correcting these deficiencies. The science of dentistry has only begun to dawn; we have begun to investigate; we have got some results. Let us stand by them and defend the ground once gained; but let us not think that this is the last of it. Supposing a man accepts the conclusion that what we term germs are necessary for the decay of teeth, he meets with many questions which he can answer but vaguely, because the fundamental facts are so entirely lacking. We have only seen the low organisms as our ancestors saw the flea. The flea was to them one of the smallest animals existing. We know that the flea is an elephant, an Atlantosaurus among the world of creatures that has been discovered. Under the microscope, we have found a most complicated structure in the flea. So, I do not doubt, we will find still a very fine structure in the micrococci: diplococci, bacteria, etc. But we will not have to be satisfied with microscopes that magnify only one or two thousand diameters. We will have to get instruments of many thousand diameter's magnifying power, etc. Will we get them? Only the man who knows but little would dare to answer, No. No one has arrived at the end of things and at perfection. We are as far from perfection as Cicero was when he supposed the arteries to be air tubes conveying air through all the body. Our theories have become more and more microscopical, to speak so; but probably a thousand years from to-day people will laugh at our microscopical ignorance as much as we

laugh at poor Cicero and his ignorance. We settle more and more the coarser facts, but we soon arrive at a border line, where we will be just as much at "loggerhead" as Aristotle about the action of the heart. I believe that we will get microscopes of almost infinite magnifying power. I do not wish to discourage, but to show the necessity of going for the latest. The old is always and necessarily more imperfect than the new; improvements are made everywhere. Compare the beautiful drawings in Dr. Heitzmann's book with the childish cuts in Frey's book, with only a few years' difference.

But one thing I would like to say: Let us not waste our time and efforts in isolated attempts which necessarily will be fruitless. If a man with a microscope mounts to-day a bee's sting, to-morrow a beetle's tongue, after to-morrow a dental pulp, he appears to me like the boy who is playing billiards every day; he has no settled plan; he likes to make a shot, and feels proud if successful. With all his playing he will never find out the laws of the balls, or anything else about it, if he does not direct his experiments in a certain scientific manner. The success attained in such isolated play-work with the microscope may be pleasing to the one who does it, but the satisfaction of having accomplished something will be lacking.

Let us hope that some members will find time to give their full attention to one small subject of interest to dentists, and let him investigate that alone, with a view to know everything knowable about it. Only thus will we have real progress and real advancement.

A NEW WAY TO SECURE LOOSE INFERIOR INCISORS, ETC.

BY J. HARDMAN, D. D. S., MUSCATINE, IOWA.

A case: Mr. B., an intelligent farmer, aged about 55, had a very loose right lateral inferior incisor, caused by waste of alveolus from calculi, etc. The teeth were close together, and worn blunt, and this one was elevated one-eighth of an inch above the rest. The patient could vibrate the point in an arc one-third of an inch to and fro, and the annoyance had become unbearable.

Finding, upon inspection, that the teeth upon either side were quite firm, I discouraged extraction. Patient concurring in my advice and plan of treatment, I proceeded at once to operate.

1. Cut off the end of the loose tooth to a level with its neighbors.
2. Drilled a hole one-half line in diameter directly into the end of

the crown, about one-eighth of an inch deep in this and the tooth upon each side.

3. With a one-fourth-inch circular saw (which was also used in cutting off the end of loose tooth) in engine, I cut a fissure transversely through the end of this tooth as deep as the hole, which it crosses, extended the fissure to the same depth in the teeth upon each side, but only to the center hole, and of the side next to the loose tooth. I now had a fissure or slot extending from the hole of the right cuspid through the end of the right lateral incisor (the loose tooth) and into the hole of the right central incisor.

4. A stiff bar of silver plate, cut about one-eighth of an inch wide, and long enough to reach from the hole of cuspid tooth to the hole of central incisor, and through the fissure of the loose lateral, and with each end folded upon itself was adjusted to lie snugly in the fissures, so as to form a yoke extending through and connecting these three teeth.

5. Anchored this yoke-bar by placing some soft amalgam in bottom of slots first; put bar in position, and by a few taps with a small hammer brought it home, and finished the anchorage with harder working amalgam.

This case has been inspected since doing good service for months, and is indeed proving very satisfactory to the possessor.

It may be in place here to state that silver for the yoke and amalgam for anchorage were chosen in this case, because of the close approximation of the teeth—but little surface liable to oxidize and be in sight to mar materially the appearance in the mouth. A few days subsequent to the insertion it was dressed and polished, and use will continue to keep it nice while it lasts.

If the amalgam used be strong, non-contractible, and in every way good, satisfactory results may be confidently anticipated. The bar may be made of gold or platinum, and the anchorage may be done with cement or amalgam first in the bottom of the slots, and then finished with cohesive gold—making proper retaining surfaces both in tooth and cross-bar. It is quite evident that this plan of support may be applied so as to secure even the entire four incisors by anchoring them to the cuspids which usually remain firm so long.

If the teeth are *not very loose* or *sore*, they can be operated upon at once; but if quite movable, some means should be resorted to to keep them steady during the operation. Plaster-of-paris or gutta-percha has been recommended. I find a sufficient agent in a strong

waxed linen thread or twine—beginning sometimes as far back as a first or second bicuspid, to which it is firmly tied around the neck, then continuing to tie tooth by tooth until all are secured to a firm one upon the opposite side—care being taken not to draw any out of natural position. Yet, in certain cases, the ligation may be so managed as to bring any too projecting incisors sufficiently back into line. A fine soft iron or copper wire may be used in lieu of the twine, either of which can be readily cut and removed after the completion of the operation.

One of the almost indispensable implements used in this operation is a nicely running circular saw, of about one-third of an inch in diameter, for cutting off the ends of loose teeth, and making the slots, etc. They are (when of varied sizes) also quite useful in cutting out fissures in crown cavities, trimming edges, cutting out old fillings, etc. If not obtainable from the dealers of the proper desired sizes, they may be readily made from the handles of broken separating files. Draw the temper by heating and cooling very gradually; drill a hole (which may be squared with a fine file point) and cut as circular with snips and files as you can. Make a shaft out of iron wire to fit your engine (these iron shafts are convenient in many ways), and dress the end to fit the disk hole, into which secure it by riveting. Now put it into the engine and true up by running it against a sharp file, corundum, etc. Next put it into the vice and, with a well adjusted and hard chisel, cut the teeth by even taps, one tooth behind the other, shifting the little wheel in the vice as required until completed. Then put into the engine once more, and true the teeth where needed; then temper by heating upon charcoal and, when quite red, drop into water.

A half-dozen of different sizes can by a little experience be very soon made in this way, and may be re-sharpened by drawing the temper and using a fine-edged file, when the temper may be again restored as at first.

To resume: In cases where the ends of the teeth are too thin for transverse fissuring for receiving the yoke-bar into the ends of the teeth, a shoulder is cut with the circular engine saw, upon the labial surfaces of the teeth, say one-twelfth to one-eighth of an inch down from the cutting edge for the lower edge of the bar to rest upon, while it lies snugly against the teeth. Then a fissure is cut down through the cutting edge with the saw or file extending antero-posteriorly nearly down to the shoulder, and large enough to receive a pin, and so shaped that the pin may be well anchored therein.

If the ends of the bar are to extend to the cuspids or bicuspids, provision is made to anchor these by cutting dove-tailed slots or orifices suitable for the purpose of anchoring these ends. Now an impression with wax or modeling composition may be taken, and the patient dismissed for a time. The model thus obtained will do to adjust the yoke, which may be made of platinum or gold, or gold alloyed with platinum, and pins of the same soldered at the correct points to the bar, so as to nicely lie into the slot in each tooth, while the bar lies in position, with properly formed heads or retaining notches, and the ends of the bar doubled upon itself (or other approved way) to favor firm anchorage, etc. The patient is now recalled, and the appliance is in every way adjusted to meet the desired end. When all is ready, the anchorage may be done with good amalgam, or it can be done with gold. I prefer the former, as I think that in most cases it can be done better, quicker and, if care is taken in packing and dressing up after it is hard, it will look quite well and do longer and harder service than gold.

In this plan of resting the yoke-bar upon and against the lingual surfaces of the ends of the teeth, a hole through each tooth, in lieu of the antero-posterior slot, may be practicable, and a neater way. (And it may be done without impressions or models.) The bar being adjusted after the holes in the teeth are drilled and properly countersunk or under-cut, with a sharp pointed instrument the bar is marked opposite each orifice as a guide where to put the pins. These pins are readily secured to the bar by riveting and soldering, some notching upon the pin for anchorage upon the part that must lie within the orifice, and the pin left long enough to project so as to be flush when dressed up. Anchorage may be done with oxyphosphate of zinc, or any good cement; but without doubt the most reliable way would be to anchor with amalgam, and especially so, in anchoring the ends of the bar in the firm teeth.

The great advantage in applying the support at the *points* of the teeth is quite apparent upon a little reflection. The waste of alveolus has been greatly accelerated in these cases by the irritating movement of the root pressing unduly against the borders of the alveoli, keeping the absorbent process too active. And the same condition, to an extent, prevails where the support is placed at or near the neck of the tooth. As in those cases the points of the teeth are found turning outward—force upon the points in mastication doing this, while the root is at the same time forced unduly against the inner part of the socket border and causing an increase of waste there; the middle support acting as a pivot or fulcrum; making it evident that such a plan can give but temporary relief compared to the mode here presented.

EDITORIAL.

SOMETHING ABOUT ALCOHOL.

The July number of the *Ohio Journal of Dentistry* contains an article by Dr. H. W. McClellan, on Alcohol. The author is too much in the word medicine; he fights about the naming and classifying of alcohol, whether stimulant or narcotic. All of these classifications in medicine into stimulants, sedatives, expectorants, narcotics, etc., are very handy for practical use, but considered scientifically, they give only *one* single property of the drug, which in every case is very complex. The fight about these words seems to us still less valuable than that of theologians about their forms of fetishism. The question of the action of alcohol becomes so very complicated by the fact that most observers entirely overlook, that it makes an enormous difference whether an ounce of alcohol be taken absolute, with 30% water (whisky), or with 10% (wine), or 5% (beer), or 3% (cider); if it be consumed all at once or in intervals, etc. One ounce of alcohol, of 100%, taken at once, may prove a most powerful narcotic poison, but one ounce of alcohol, taken during the day in the form of teaspoonfuls of wine, may prove a good and genuine stimulant. Hammond has made very fine experiments, which proved very satisfactorily that moderate quantities of alcohol first prove what must be fairly called a stimulant—that only the after reaction is narcotic. "Alcohol is in no sense food," says the author. Well, to go to figures: The French cities have a kind of pavement tax which is levied upon all kinds of food brought in to them by teams. This allows a statistic of the consumption, and if Dr. McClellan will compare the figures, he will see that those cities which have the greatest wine consumption have the least bread consumption. Though this may depend on other factors, yet it goes a trifle in the way we always considered alcohol in the economy of the body, namely: Taken in small amounts and slowly, it is burned in the lungs just as fat and sugar, and thereby supplies a certain amount of these. As one kilogram of alcohol gives about 7,000 metric calorics or heat units, it replaces about three-fourths of a kilogram of fat. Unfortunately its caloric effect is very soon counterbalanced, if taken too strong, by the nervous depression following its use, so that while in small quantities it is a useful caloric food, in larger ones this useful quality is destroyed by its action on the nervous centers. There is a point of equilibrium between the two, and the

problem is to keep the effect of the alcohol restricted to the calorific effect. According to experience and experiments, from one ounce to perhaps ten ounces a day may be burned up in the body, if introduced slowly and uniformly. The lungs burn up many a substance which does not form a normal constituent of the tissues, and yet gives heat. Dr. McClellan says sugar is found in the body. May be, but only grape sugar; yet we eat hardly anything but cane sugar, a distinctly different substance, and it is burned up. Acetic acid, etc., etc., are all eaten, though not found in the body, and they are all burned up, supplying heat.

The editor of the *Ohio Journal* hitches his own fire-cracker of "I told you so," to Dr. McClellan's article. We should hesitate to accept this exclusiveness. We disbelieve thoroughly in the use of alcohol by a healthy man without need, but under circumstances, everything from a homicide to strychnia, alcohol, milk, and a beefsteak, may be a blessing or a curse; only the human intellect can be our guide.

A LOOK INTO THE FUTURE.

The gold supply of the world is put at about $200,000,000 every year. About $1,000,000 worth of this gold is put into the teeth of people, and as this gold is almost invariably lost from further consumption, it might not be quite uninteresting to inquire if that is right, from an economical standpoint. It will of course not make a great difference to us at present what becomes of the gold. The supply will be sufficient for our wants and those of our children; but the question may come up, do we not do something wrong against future generations, following us, by burying every year about two tons of gold in the teeth and finally in the earth. It is the worst use we can put the gold to, to throw it in the ground.

In very many, and even most cases, it may not be worth taking the gold out of a tooth of a corpse, but after all it is a serious loss to our wealth. Gold is considered at present as an equivalent of work. One ounce of gold represents the hard work of a mechanic for about ten days. This means that we throw away uselessly every year the value of the work of an army of 2,000 working men for an entire year. We do not know any better way of storing up work and its value than gold or precious stones. The question under consideration is, therefore, not only one of simply losing a few grains of yellow metal, but one of wastefully throwing away the saving of a large

amount of labor. The labor of this army of workers is perfectly wasted, if we do not preserve the gold. As a further point of consideration, there comes up the supply of gold. We know it is limited. California will not furnish gold for twenty more years in quantities to count. The gold supply of Australia will probably be exhausted in some thirty years. What then? The outcome will be that the gold will either disappear entirely, or will attain a value which puts it outside of the reach of wasteful dentists and jewelers. Thus demand and supply will equalize themselves. Silver will have to take the place of gold, and a general upsetting of a relation of trade for some years will follow. We do not have unlimited wealth on this globe of ours, and wastefulness will be sure to find its punishment. It will be the same with petroleum, coal, etc. The children of a wasteful generation will have to pay the fine.

Gold fillings at present ought to be much higher than they are, considering the political economical wastefulness implied in the use of this metal. If dentists could fill teeth with iron, there would be no danger of the supply getting exhausted; but all over the world the gold market is already in a trembling, nervous condition. The demand far exceeds the supply, and only by the combined efforts of the different gold-coining governments, can an artificial standard of the value of gold be maintained.

A DENTAL JULES VERNE.

In the *Ohio State Journal* of July, 1883, there is a very curious paper by Dr. Watt on *Helps in Study!* There occurs the strange sentence: "Now, do we need microscope, balances, reagents, etc., to settle this question? (namely, as to the existence of the varieties of decay.) Certainly not." (!!!!!) Why, doctor, you are too clear-headed, you have done too much in the profession to believe that statement of yours! If Jules Verne travels 20,000 leagues under the ocean, or makes his journey to the moon, or in the balloon across Africa, then he does it without the use of scales and similar measuring instruments. Has Dr. Watt, in his theories about decay, arrived at that point? Now they become intelligible to us; now we have the key! "Truth, simple, pure and bright, is found only in this way." That is what Dr. Jules Verne Watt says at the end of his article. Doctor, you are too smart and learned for such enunciations as the first above we quoted from you. It did not grow with you; it comes, as Dr. Atkinson would say, from the bottomless pit of darkness and ignorance.

PRACTICAL THINGS!

"Practical things are what we want. Give us formulæ, give us advice pressed into a nut-shell; make a pill out of it that we can swallow blind, so that we can have sleep." That cry is only too often heard from what are so-called practical men. They think they are a peculiar sort of people. They do not give themselves to dreams! They despise such things, but they know what is needed. Beware of such men. They are generally lazy hunters after the crude dollars—too lazy to think, too lazy to have an opinion of their own. They are the men who will hire another man for $3,000 a year, call him a minister, and make a kind of contract with him that he is to do all their thinking for the whole year. He has, so to speak, to chew their intellectual meat for them, and to digest for them the truth of their denomination. A man who is not able to draw his own conclusions when a theory is presented to him, or a certain fact is established, is not fit to call himself a rational being. We have very rarely found anything at the bottom of the cry after formula except laziness, indolence and stupidity. The man who tells us the way in which to solve a certain problem, is far more useful than the man who does the problem himself and makes us copy it. We will learn much from the first, but very little from the last. The spirit of the musing philosopher is not such an unpractical spirit, after all. To whom do we owe nine-tenths of the progress in modern organic chemistry? To the dreaming, abstruse Germans. But when it comes to the question of who will have the most dollars, then very often these so-called practical, but really only unscrupulous men, who wish to get the essence of years of work without paying a penny for it, are often the most successful. Quite a number of our correspondents want practical hints, some without even subscribing to the *Journal*. Now, if we should know anything that is practical, out of mere spite we would not give it to such a fellow. Every laborer is worth his pay, and if a man gives the result of perhaps many years' experimenting without some kind of remuneration, here in America we may very properly call him a fool. A great deal of our patent law fights are between the men who want to get somebody's invention for nothing, and the poor fellow in self-defense who fights for the offspring of his brain. Never encourage the unscrupulous stealing of "practical men."

Several of our old subscribers have failed, thus far, to send in their "enclosure" for 1883. It may be *you*. (?)

DR. MILLER'S ANALYSES OF DECAY.

In the July number of the *Cosmos* is the paper of Dr. Willoughby Miller, of Berlin, read at the meeting of the two societies at Springfield, June, 1883. The paper contains a great amount of analyses. We only regret that the "artificial caries" was included in some of those otherwise really valuable experiments. The calculation of a reduction of the lime-salts from 72 to 59%, to correspond to a loss of $\frac{317}{720}$ or 44%, is made under a few hardly admissible suppositions. First, that the normal dentine from which these masses of decay were taken had 72% of lime-salt. We just doubt that very much. Decaying teeth are mostly not teeth with the highest amount of lime-salts, but with lower percentage of it; if we only suppose 71%, the loss is 41%; with 70% of lime in the original dentine, the loss is 39%, etc., variations of more than 11% among each other, etc. The second supposition, perfectly inadmissible, is that the organic matter, water retained at 120° C., etc., have remained the same. These calculations become very different when we take the water into account. Teeth in the mouth are never dried at 105° C. (221° Fahrenheit), and then exposed to the action. The general results of our analyses (*New England Journal*, January number, 1883), agree very well with those published by Dr. Miller. The average of the two analyses of layers two and three is 56%, or exactly that of Dr. Jeserich. My outer slice gave somewhat more than the similar analysis of Dr. Jeserich, but the identical figure with the softened dentine. Thus the results of my analyses have only been confirmed by those authorities. What Dr. Miller says about "absolutely perfect manipulation," is untenable. With "absolutely perfect manipulation," we cannot and never fail to get absolutely perfect results, only we never have absolutely perfect manipulation. We know that 10% error is very easily committed, but it depends on the kind of analysis and the aim, if 10% is "absolutely fatal to the analysis." Among chemists I will give you a specimen of an excellent analysis which nevertheless is even 25% wrong in one constituent (H), and 5% in the other (C).

C	3.2	ought to be C	3.05
I	96.7	" " I	96.70
H	.2	" " H	.25
	100.1		100.00

The substance, as you well know, is Iodoform C_2I_3H. For the purpose in view, the analysis is excellent nevertheless; thus an analysis

even 10% wrong may be excellent under some circumstances, while it may be worthless under others. While my conclusions and those of every one may be erroneous, the figures of my analyses and those of Dr. Miller agree very closely, and show unmistakably that a larger amount of lime-salts is left than e. g. exists in normal bone; and while bone with 54% of lime-salt is healthy and hard, dentine, with 59%, and in some cases 65% of lime-salts, is dead and soft. There is the point! Dr. Miller in the paper, as read by Dr. Barrett, expressed his surprise at the large amount of lime-salts present in decay and, as we think, justly. The final "questions to be determined" in Dr. Miller's paper are very illustrative: "What other agents besides acids assist in the process of decalcification? Do bacteria produce a ferment capable of decalcifying or softening dentine?" Dr. Miller promises further researches; they cannot be but valuable. But let us not forget that whatever acids may do, they do not produce *caries.* They may soften some dentine, but that is no caries yet. They may dissolve lime-salts, but that is only abrasion. We do the same when we eat pickles, sour kraut, etc. But that does not give us caries. There is another more important factor than acids in producing *caries.* A scratch of the skin is very different from a pimple; a pustule is very different from a cut, though the scratch or cut may become a pustule or gangrenous. Caries, when once developed, is a gangrenous or putrefactive process in the dentine, which putrefactive process, we claim, is impossible without lower organisms. Before that putrefactive process has set in, it is as improper to call an abrasion by acids caries, as it would be to call a scratch a gangrene.

SOMETHING ON "CHEMISTRY OF DECAY."

Our readers may enjoy a little side-show. While at the Union Meeting at Springfield, we took short-hand notes of Dr. Niles' paper on Chemistry of Decay, which notes appeared in the July number of our *New England Journal;* the paper itself appeared in the July number of the *Cosmos.* If they compare the two, they will be surprised at their close resemblance. The notes and our report were not intended to be verbatim; they were intended to be used on the spot; but they are a fair rendering of the paper. They show to the profession the need of verbatim reports. A meeting with such reports is far more interesting than a report where every member can afterwards look over what he and those after him said, and correct it accordingly. A

few errors crept in, from the fact that in absence of the stenographer somebody else had to read the proof. Some curious but otherwise indifferent misunderstandings may be noticed, like nitrate for citrate, etc. At a few passages, Dr. Niles—not unfairly—corrected errors in his paper, as in the *Cosmos*—see page 214 *New England Journal of Dentistry,* foot note, and page 354 *Cosmos,* for 1883. There is a passage in the paper as read in the *Cosmos* which was not in our short-hand notes, though it may have been read—perhaps because it did not then seem to us necessary for the completeness. Dr. Niles says: "The scientific editor of the *New England Journal* should also tell the dental profession the modus operandi of testing for acetate, lactate and citrate of lime in carious teeth without the use of litmus." Doctor, with all respect of your chemical ability, this time your pen has run away with it. You ask how to test for those salts without litmus. Can you test for them with litmus? Are they not neutral, or, if anything, slightly alkaline. How can a neutral substance in a mixed liquid in the presence of acid salts be tested for by litmus? You say, decay reacts acid. I admit it. Your tests have proved that to me, though I think your tests were at the surface of the decay. Alkaline or neutral salts in the presence of the possible acid phosphate of the formula $P_2O_8Ca_2H_2$—perhaps even $P_2O_8CaH_4$—which you yourself suggested, and whose existence I consider probable at the outer layers, cannot be tested by litmus. You know as well as I that this is not possible. Well, I have asked Dr. Watt, who talks so much about lactates, etc., how he proved them, but he has not told it yet. Acetates, etc., you know yourself how to test for—about 3% of an acetate in a liquid may be found by the iron test, if very carefully made. Citrates I doubt if ever exist in teeth, their easy decomposibility renders it very doubtful. We have no very good test for it. They would have to be isolated and proved by ultimate analysis or measurement of the angles of citrate of lime, etc. The same is good for lactates. But all these organic lime-salts are soluble in water, and in my cases I found no soluble lime-salt at the innermost layer. I of course found them at the outermost layer, but there they prove nothing; they are of as little importance there as the leptothrix buccalis, which sometimes forms an almost velvet-like layer. The solubility of lime-salts in water is characteristic for many hundreds of organic acids, and only few—most of them highly improbable—are not soluble. The most common insoluble organic lime-salts are the oxalate, stearate, oleate, tartarate, etc. But as oxalic and tartaric acids are no products of fermentation, their existence in decay is probably not claimed by those who consider the acid process as most important in the production of decay.

M.

[Thinking that there are too many good points in this *private* letter to remain private, we give it in full, with the author's consent.]

DR. STOCKWELL:

Dear Sir—Many thanks for your kind letter; have not had time till now to reply. In your note to my abstract, you say "there is no caries until the putrefactive process is inaugurated," &c. If this is so, or will be accepted as true doctrine, then the battle is won for "bugs."

Cohn says: "Putrefaction is a chemical process induced by bacteria." Therefore, I say, no bugs—no putrefaction, no caries! Putrefaction—plenty of bacteria, plenty of caries! The need of a short, concise definition of caries is more and more apparent, and some of the theorists had better hold up till this peg is set, and it is known where we are to start from. As you say, it would save much useless blundering. But what can we expect? Many dentists look upon a tooth as an "ivory plug" set in the jaw, much as a cedar post is set in the ground, and like it, only acted on by external causes, taking no note of the provisions made for the nutrition of the parts, and showing by their practice that physiology did not enter into their list of studies. And, on the other hand, when our Professors will lecture twice a week from September to February on the "cell doctrine," and crowd into one lecture the subject of the nervous supply of the teeth, and matters connected therewith, what can we expect from them in the way of sharp, terse definitions? We have to look to the *workers outside* for help, and let the dreamers sleep on till, like Irving's Dutchman, they wake and find themselves left.

You say "the lowering of the vitality of the structure, or its breaking down, cannot be called caries, but a *favorable condition* to caries." Granted; but I think there is a closer relation between the two than is apparent at first thought—something akin to the relation which irritation bears to inflammation: it is hard to tell where one leaves off and the other begins. I wish you would write at length on this point some time, for it is one I am much interested in. I have no theory to promulgate. I am after facts, and am ready to go where they lead.

* * *

In the March number of the *Journal*, page 78, I find "some interesting correspondence." It *did* interest me, and if we could have a department in the *Journal* where "pegs" may be set up to become "pins" in the lining of our hats, we may all be set a-thinking. I

should be willing to do my share towards finding "pegs" or "pins," as the case may be.

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Have you ever met with a carious condition of the teeth following a severe fever, or in a patient who has used large and frequent doses of bromide of potassium?

I am at work on a series of experiments to find if possible what part, in the production of a "condition favorable to caries," is due to some of our common articles of medicine improperly administered.

Did you ever feel just as though it would do you good to have a real good "growl"? I feel just so now. I have just paid a visit to a young dentist—a young man just from college, and a worthy young man; but he thinks now he has only to wait for *customers*, and I wish I could make him and all others feel as I do on this subject. Every professional man has been obliged to go through this "waiting process," and the manner this waiting is done has much to do with the future of these young men. Text-books at hand, the literature of the profession before them, microscope on the work-table—with these, and a proper sense of the importance of being well prepared for their life-work, any man can hew out for himself a pathway through the throng of men that are fast crowding the professions, and who think, because they have a smattering of the mechanical details of the business, there is no need of more, and wait for patients as the tradesman waits for customers, suffering the golden hours to pass with nothing in the way of facts learned to show for them. To any young man who thinks he has only to wait for customers, I would say, as Longfellow has it, "Learn to labor and to wait." Waiting without labor profiteth nothing; but earnest labor and patient waiting never goes unrewarded. The two years following graduation can be made more valuable to the student than the four years before. He now is able to see for and guide himself, and, knowing his weak points, strengthen them.

I now have in mind a young medical friend who spent the spare hours of his "waiting period" in writing out a syllabus on anatomy and chemistry, with an hour's work each day at the microscope. To-day a Western university is reaping the benefits of that man's devotion to his profession, and to his classes he says: Young gentlemen, be careful of the spare hours of the beginning of your professional life; then will be the time for you to lay up stores of knowledge to draw upon when a larger practice in years to come will leave little time to study."

Would it not be a good thing for the editor of the *New England Dental Journal* to lay out a course of reading for young dentists? Why not get up a dental circle, after the plan of the Chautauqua Scientific Circle?

But enough of this rambling sort of talk, for I have let the pen run as I would my tongue if I were with you, throwing off all restraint, and talking as friend to friend. Hoping that I may hear from you when you have the time,

I am, yours truly,

———

How very different sanitary conditions of certain countries in Europe are as compared with American cities, may be seen by taking a few figures from the statistics from Munich, southern Germany. A shocking fact to a New Englander will be the statistics of births. Thirty-five per cent. of all the children are born out of wedlock. Out of the number of 250,000 inhabitants, 10,000 births occurred during the year, 7,061 deaths, showing an excess of some 3,000 in favor of births every year. Among the cases of deaths, children's diseases predominate by far. Some 40% of all the deaths occurred among those under one year. No case of delirium tremens occurred during the whole year, and that in a city where it is almost a disgrace to drink water. Seven hundred and fifty people in that city were older than 80 years. Among the diseases which proved most fatal to adults are diseases of the respiratory organs, which caused 70% of all the deaths among adults. The high elevation, some 1,800 feet, has much to do with that fact.

Having a larger supply of Volume 1 on file than we desire to keep further, we will furnish, to a limited extent, the entire volume to subscribers, or others, for *one dollar.*

Subscriptions taken for Volumes one and two for *three* dollars. Those of our subscribers who commenced with Volume 2 will, we feel assured, find it to their interest and profit to avail themselves of this opportunity to complete the file of this Journal.

Please send in your orders, gentlemen, at once.

SOCIETIES.

UNION MEETING OF THE MASSACHUSETTS AND CONNECTICUT VALLEY DENTAL SOCIETIES.

[Continued from page 221.]

SECOND DAY, JUNE 7, 1883—*Forenoon Session.*

The early part of this session was given to clinics in crown-setting, by Dr. H. W. F. Buttner of New York, and Dr. H. A. Baker of Boston. Much more than the usual interest in clinics was manifested on this occasion, and both methods were illustrated in a manner that won much praise from an eager crowd that surrounded the several chairs. As soon as the operations were completed, the convention was called to order, and Dr. Baker proceeded to explain his method of crown-setting and bridge work, by the aid of some very beautiful colored diagrams, in a manner that showed him to be a master and expert of the art. A general discussion followed as to methods and details, that was generally participated in by the members. It was noticeable, however, that the largest amount of enthusiasm and confidence in the practicability and durability of "bridge work" in general was manifested by the younger members. This was illustrated by a call from the chair—occupied by the venerable Dr. Searle—for a statement of experience, looking towards results. After waiting for some moments in vain for a response, he remarked that he "heartily congratulated the profession in general, and especially the *public*, that so few had any experience to report." He had practiced it to a limited extent for thirty years, but in a different method from that which is so generally advocated at the present time. By his method, the "bridge work" was removable at will.

Dr. E. H. SMITH, of Boston, defended the practice, and related the results of his own experience in several cases which have proved durable thus far, and promise well for years yet to come; believed the work practical if properly performed, and urged its adoption by the profession.

Dr. GEO. A. MILLS, of New York, read a short paper complimentary of Dr. Riggs, of Hartford.

"UNCLE JERRY" ROBINSON, of Jackson, Mich., was given ten minutes to explain the nature and uses of his new fibrous metallic material for filling and lining vulcanite plates. He took but *five* minutes, however.

Prof. T. H. Chandler, of Boston, opened a general discussion on Amalgams. He believes that amalgam is a genuine metal and not a fusion. Stated his methods of testing and using it, and considers it better to use a good amalgam in many cases than to half kill a patient by driving in a gold filling. He absorbs the excess of mercury after the filling is made by the use of pure tin. The use of tin also leaves a whiter surface to the amalgam than would otherwise be obtainable, and does not render the surface soft, as is often supposed. Believes that better results are obtained by using the amalgam in quite a plastic condition and afterwards absorbing the excess of mercury with pure tin than by trying to use it very dry. Better adaptation to the walls of the cavity can be thus secured. Tin should be applied to the surface of the filling as long as it will take up any mercury. His tests show that only two of the amalgams in the market are absolutely non-shrinkable.

Afternoon Session.

The meeting is called to order at 2.40 P. M. by the president of the Connecticut Valley Association, Dr. N. Morgan. First subject: The papers of Dr. Miller, of Berlin (Ger.), read by Dr. W. C. Barrett.

Dr. W. C. Barrett (Buffalo): I said already yesterday something about the anomalous position I occupy. About two years ago, in Germany, we had the pleasure of meeting Dr. Miller, a true born American, who is as proud of his birth and American citizenship as any one of us can be; and because he lives abroad, that is no reason why we should not consider him an American dentist. Dr. Miller is a young man; he feels that he wants a place in the profession, and it is here where he cares to make a name; it is here, at home, among the American dentists that he wishes to be known; but, being so far away, he is at a disadvantage.

Dr. Miller graduated from Ann Arbor University with the highest standing; from Ann Arbor he went to Edinburgh, and there he pursued his studies in applied mathematics and chemistry under the best teachers to be found. His aim was to qualify himself for a mining engineer. From Edinburgh he went to Berlin, and there he was under the tuition of men like Helmholz, Virchow, etc. There his health broke down; at the same time he became acquainted with Dr. Abbott, whose home is the headquarters of American dentists in Europe. One evening every week is devoted to meetings of American dentists. He was coaxed into the profession of dentistry by Cupid and Hymen; he married Dr. Abbott's daughter, came back to this country, graduated at Philadelphia, and has been practicing since in Berlin.

Dr. Barrett then reads the two papers of Dr. Miller. Our readers will find both of them in our *Journal* at another place. After this, he reads some conclusions of Dr. Miller, not differing materially from what was already stated previously, and gives some of his own views. In concluding, he says:

Not very long ago I was at Cambridge with the purpose of investigating the very large collection of skulls there, especially rich in skulls of aborigines before their contact with the whites and, in consequence, free from syphilis and its consequences. What was the condition of things there? I found the same condition of things that we find in our patients; I found caries in the teeth of the South Americans and the Peruvians; I found caries to exist there most extensively; I found exostosis of the teeth, but only a few irregularities; I found the most extensive abscesses I ever saw in the mouths of patients in my practice,—and God knows I have had bad ones; I found teeth covered with tartar and absorbed to the very apex; I found the results of such diseases as made me pity the men and women who suffered from them (they had no dentists in those days), and the results of suffering from diseases were really astounding. The theory advanced by men that caries is due to our altered manners of living, etc., in fact, to our modern civilization, is erroneous. I was surprised, I was astonished, when I saw those things there.

I have something else of interest that I will show you. There were found in a cave in Mexico six skulls; they are all dolichocephalous; the specimen of a jaw which I am going to show you is that of a muscular man, age about sixty. It was found with fragments of basket and wicker work. There are in this lower jaw two teeth with decay, and it is supposed that these teeth are filled; if this be the case, we will have a record of an undisputed prehistoric filling. I believe that the substance in these cavities is a real filling material. And why? Simply because a substance of the same character was found, which attached the hatchet-head to the handle; it was attached with that cement alone, and that was quite sufficient to hold it in place. It will take a chemist's analysis to positively prove what that was. If this should prove to be an artificial filling, it would be a most important point in the history of filling teeth; food would have decayed long ago. As you see, the cavity is still almost filled with this mass.

Dental Depot journals are quite good, but if we had to depend on them for our literature, it would not be quite so good. The only

independent journals in this respect are the *New England Journal of Dentistry* and the *Independent Practitioner*. Honestly, if we had to depend on the depots for our literature, and the dental manufacturers were to graduate the study, what kind of a profession would we be? They are legitimate enough, I do not argue against them, but we all want rather to be disconnected from the dealers in that kind of work. Every dentist ought to have at least one journal, and you have an excellent one right here at home; but if you wish to subscribe for the *Independent Practitioner*, I shall be glad to receive subscriptions.

Prof. Mayr: As a great number of the polemics in Dr. Miller's papers is directed against the views of my friends and also against some experiments which I made some time ago, I take the liberty of replying to a few points that Dr. Miller makes. The great attention which my few—but I insist as careful experiments as were ever made in dentistry—received, by their being tested by the best authorities of Germany, gives to them more importance than I first attached to them myself. I only made them to disprove certain theories of Dr. Watt about acids and the disputed presence of the lime-salts in decay. I am very glad that my analyses are almost absolutely verified by those high authorities, only I claim that I have made them very much more with a plan of what I wished to prove. The analyses of these gentlemen were made on a collection of decayed masses from many teeth, and therefore give only average results, which in any concrete case must be of little value; but I took one single case of decay, analyzed it fresh in three slices, each of which was large enough to give results accurate enough to base conclusions upon. The details of these analyses you may find in the January number (1883) of the *New England Journal of Dentistry*. I give the figures here:

Outer layer, 39% lime-salts; middle layer, 44%; innermost layer, 67%. Average, 50%.

As you see, on comparing the results of my analyses with those of Dr. Miller's authorities, the agreement is entirely within the variation of averages. When we wish to investigate the origin of decay, the dark outer mass is to us of hardly any importance; we must go to the border line and there, I insist, the amount of lime-salts removed is too small to account for the considerable change in hardness and general appearance of the decaying masses.

Dr. Watt tries to make his readers believe that the decayed masses analyzed by me were not the usual decay, but a rare variety. It is useless to repeat that all the specimens I analyzed were the common

form of soft white decay. I might criticise many speculative points in Dr. Miller's paper. I only will repeat what I have said, perhaps too often for your kind patience, namely:

Whatever fermentation may be able to accomplish, you have no fermentation without germs; furthermore, the action of the acid alone would only cause, as Dr. Stockwell has very forcibly pointed out, *abrasion, but not that putrefactive process called decay*. There is not the slightest proof—nay, even any amount of proof to the contrary—that fermentation or putrefaction is possible without the indispensable action and presence of "germs." If we are beaten on a point in the explanation of the caries of teeth, it is to the benefit of dental science, because we had put up that particular point, not from a mere whim, but on evidence of some facts which have to be either disproved or better investigated in order to force us to change our position; thus, either way, our putting up a theory will result to the best interests of the profession. Already a large literature about theories of decay exists and is increasing daily.

Dr. F. Y. Clark: I wish to say a little about those micro-organisms. Their object is to reconstruct, to disintegrate, to break up. This holds good with the forest tree as with the animal creation. Nature never does anything wrong and is never wrong. Fifteen years ago, when I knew nothing about these things, I was induced to try some experiments which Dr. Barrett has illustrated here to-day. If you take a piece of ivory, an elephant's tooth, and bore into it, what good will it do? What will it amount to? Not to anything. There will not be found any micro-organisms; there is no animal matter of any kind for them to feed on; I would expect exactly the results which Dr. Miller obtained. But you take an elephant's tooth in the gums and try the same experiment, and you will find very different results. I have tried it repeatedly before I knew anything about these things. In the first case, I have taken the natural tooth in the mouth of a gratuitous patient—I made up for it by other work in his mouth, and he allowed me the experiment. I bored two holes into the right first inferior molar on its buccal surface. I then took a particle of carious dentine and put it in hole number one. I then took another particle of carious dentine, dried it and dipped it in carbolic acid—it was a crude experiment only—and put it in number two. I then filled both holes hermetically. I had to refill number one after nine months. That proves that caries is contagious. After what I have heard here from Dr. Miller, I shall repeat some experiments. If you take a

carious tooth and put it in sterilized water and let it remain there for awhile, and examine the fluid afterwards, you will find something that was not there before. This is the same result which also Dr. Miller proved, and I do not know but we may come out the same hole after all. It proves that carious dentine contains organisms. Now the question arises, where do these organisms come from, how do they get into the tooth, how do they get into the mouth? Tyndall has shown that the dust in the air often consists of 50% organic substance. We breathe them with every breath; they are everywhere. I do not believe that they enter the tooth directly, but they will collect in all the little pits, fissures, etc., where they will find little laboratories, and there they will do their work of entering the tooth structure. First a ferment called microderma vini is there, then follows microderma aceti, and they open the gateway. Thus they get through the enamel. This gateway is sometimes very small—sometimes so small that it cannot be discerned with the naked eye, but they will work up into the dentine, into the tubuli and into the meshwork. What for? Just for amusement? They are not after the lime-salts. What is their pabulum? It is the bioplasson or the liquid contained in the canaliculi of the tooth. They never eat. No one ever saw micro-organisms eat. They do not eat because they have no mouths; they live by absorption; they absorb this fluid, and what is the result? It is disintegration of what we call the structure of the tooth. Another illusion of Dr. Miller's I have to contend, namely, that the micro-organisms have no pigment; I think I am correct in understanding him thus. Now we find in carious teeth a structure which we call micrococcus prodigiosus. In olden times they used to consider a little red color on plants as blood; it was an object of superstition; it is this micrococcus prodigiosus. It cannot be told from micrococci, but it is also in teeth. Dr. Miller has also stated in a former paper that bacterium termo was not found in the carious dentine at all. We know it is a very easy matter to take other organisms for bacterium termo; they resemble each other so much that hardly any one can tell them apart. But we know that without bacterium termo there is no putrefaction. As certain as the sun rises, wherever you find bacterium termo, you will find the odors of putrefaction. You are almost tired of the subject. I am sorry for it, but I feel that there is still a great deal of fighting to do; we have worthy antagonists. Three years ago Dr. Abbott, of New York, stated that the organisms could not be found in caries at all; and then Dr.

Miller came out and proved them to be present; no better evidence has been found, and Dr. Abbott had to give in. There was Dr. Clowes, who has wit and humor. He took the ground that the action of acids on a tooth may be illustrated by putting an egg into vinegar, which will dissolve the shell and leave only the yolk. That was given as the sum total of the subject; but Dr. Clowes has been taking the *New England Journal*, and sometime ago I heard of the conversion of Dr. Clowes to the germ theory. I only want to show that we are a little on the ascendancy, that we are gaining ground.

I wish to speak about another thing. The second Tuesday in August, if you come to Saratoga, we will give you all a cordial welcome and show you the very thing. Now, supposing our theory is correct, what will be the practical conclusions? If you look upon caries as the result of bacteria, then you have an intelligent way of treatment. You can treat your cavities antiseptically, and in so doing you will be astonished at the result. The old theory was to neutralize supposed acids by *alkalis*. I now rely on antiseptics alone. I carry it thus far: If you come to me with a tooth considerably decayed, where there is doubt as to the exposure of the nerve, and if I excavate the cavity, I remove simply the border of decay; I do not care about the floor of the cavity; I will disinfect it; I will put carbolic acid in it or mercury bichloride—one of the best of antiseptics; I put on the disinfectant, leave it over night and then fill the cavity. I have carried on this practice for fifteen years, and if you examine fillings eight or twelve years old, you will find the great majority of them in a normal condition. You will find recalcification.

You are now using the latest and purest amalgam, one that will not shrink, but one of the best is the old copper and silver amalgam. I have one of them in my mouth. It was put in by myself with my fingers. It is one of the best fillings in my mouth. In amalgams, the disinfectant power of the mercury will somewhat come into play, and many of you have seen the bottom of a cavity that has been filled with amalgam, sometimes as hard as flint. That is one of the additional proofs in favor of the germ theory.

We have heard a good deal said about Riggs' disease. I do not know exactly what it is supposed to be, but I have had cases of teeth for a number of years, so loose that you can almost remove them with the fingers. By removing all foreign substance, stopping the collection of pus by antiseptics, using carbolic acid full strength—keeping a glycerine bottle ready to wipe it off if it gets on the lips—and re-

peat it a couple of times, you will be astonished at the result. It is one of the most valuable things in the treatment of the affection; sometimes a perfect transformation takes place.

Now I wish to speak about prophylactic treatment. I accept the germ theory fully, and do not think that anything can yet be said sufficiently strong against it to make me change my views. I discard all kinds of powder. I do not believe that the powders ever did any good to the gums. It may do some good in polishing the teeth. I now use a mouth wash of the following composition:

℞. Carbolic acid, ʒv.
Alcohol, ℥iv.
Glycerine, ℥i.
Oil of peppermint, gtts. iii.
Red aniline, gtts. ii.

Use carbolic acid full strength; take the crystals and put water enough into it to hold it in solution.

Dr. Stockwell moved that a vote of thanks of this assembly be extended to Dr. Miller, of Berlin, through Dr. Barrett, for his very excellent papers contributed to this meeting. (Voted.)

Dr. W. C. Barrett: We see Prof. Mayr roosting several rounds lower on the ladder than we supposed. I supposed he would take the ground not simply that without the presence of germs there would be no decay, but that it was directly and primarily due to the presence of germs. The question is this: Are bacteria the primary agents in the promotion of decay? Now, if this be the case, and this be taken as the issue, Dr. Miller does not agree with him. Bacteria must have the proper fluid in which to propagate. It is not positively settled beyond dispute that they are the primary agents in the production of any disease. Even carbuncle is not settled beyond doubt. I say there are respectable persons, whose opinions are entitled to some respect, who consider candidly bacteria not as the primary cause of the affection, but that they are the scavengers of tissues. When in a pathological condition to afford lodgment, then they step in and favor the production of disorganization and are beneficial rather than detrimental. These views are held by respectable parties. I believe, with Dr. Miller, that bacteria cannot destroy a healthy tooth. Teeth can not be infected with bacteria, as a person may be affected with small-pox—that some other primary agent is necessary to enable them to infect the teeth.

Dr. Clark: I respect all investigations, but Dr. Barrett, being a

microscopist, knows, and all microscopists are fully aware, that we of all men are more liable to make mistakes than any other class. Some statements seem to me to be almost unpardonable, and I cannot conceive how Dr. Barrett, Dr. Niles, Dr. Miller, or any other man, can say that bacterial organisms are not contagious ; that they are harmless organisms ; that they are found in all natural food, etc. This is a perfect piece of absurdity. It is not so. I am backed by every authority known.

Adjourned.

Evening Session.

Meeting called to order at 7 P. M., by the president, Dr. F. Searle, of the Massachusetts State Dental Society. First subject : "Bonwill Crowns," by Dr. Bonwill, of Philadelphia.

The very extensive paper, illustrated by many fine drawings and explanations, exceeds the limited space of our *Journal*, and we have to reserve it for some later number. It is a very elaborate and clear affair in every direction.

The second subject on the programme was the paper of Dr. J. L. Williams, of New Haven, on Dead Roots.

Dr. WILLIAMS. *Mr. President and Gentlemen :* When I came here I did not intend to occupy your time very long, and it was also with the belief that I would have some diagrams from New York, which failed to come. It is next to an impossibility to make a presentation of the subject without them. A great portion of the time during the session of the convention has been occupied in presenting the various methods of crowns which are used, and of course the durability of all of them depends very largely, almost entirely, on the physical condition of the roots of the tooth upon which they are placed. Before we can get a clear idea of a tooth, we must know something of the manner of its development. I hope you will pardon me if I speak of the *development of the root.* For this, diagrams are almost indispensable.

The tooth is developed from three sources : from epithelium, from which the enamel organ is derived ; the dental pabulum, from which the dentine originates ; and the pericementum, from which the cementum comes. The three layers—epithelium—the flat outer, the middle layer with cuboidal cells, and the lower with columnar cells, are the first tissues in the body. The first change is an increase in size of the middle or cuboidal layer of cells, and it causes a rising of the surface

and the forming of a little ridge over the position which the future jaw will occupy. At the same time, the lower or columnar cells drop down and form a cover. After the dropping down of the lower layer, there is developed a little half-shut form, a cap, which is the enamel organ. The enamel organ is filled with cuboidal cells; they are transformed into secretive organs, for which organs the circulation is taken from the plexus of blood vessels around it, so that the enamel organ is entirely distinct and the enamel is independent of the development of a tooth. At the age of nine months, hardly anything is formed but the crown. The roots are hardly developed, and the dentinal germs are concerned in the formation of the crown of a tooth. As the development progresses, the dental pabulum grows smaller, and assumes the form of the pulp; and after completion of the formation of dentine, the pericementum forms from its osteoblasts, or cells, which are identical with osteoblasts, the cementum. The pericementum does not depend on the dentine, so its life does not depend on the dentine; the root of a tooth is not dead, even if the dentine be so, and I question whether there is any evidence going to show that, if the pulp be removed mechanically and without the use of certain agents, as arsenic, the physical condition of the cementum is changed.

After some more explanations which, without the use of the improvised diagrams on the black-board, would not be intelligible to readers, he gave the following method of removing the pulp almost painlessly:

I wish here to describe an operation which is often found useful. I presume it is not new, but it is most successful: Say, a central incisor with pulp badly exposed, is presented, and any attempt to cap it would be insanity, and you wish to remove it; the common method is arsenic. But this method is this: If you must adjust a crown, you cut a groove around the tooth perhaps, if possible, one-quarter way through the tooth; and if the tooth is very sensitive, the operation, if dexterously performed, can be done without any pain. At the same time, the operation paralyzes the pulp. Then you shape a little stick of orange wood to correspond with the shape of the pulp canal; take the orange wood and drive it to the end of the root with one blow. I have done that without the person knowing what was going on, and many other gentlemen can assert the same thing. After this operation, you take a narrow broach, and with one twist, you remove the pulp entirely. Afterwards, it is my practice to use carbolic acid and glycerine which will pass to the end of the root, and drive the same stick into the root, when you have it plugged in the most perfect manner I ever saw. I

have done so in my practice, and it is to my knowledge one of the most successful operations I ever knew. If the pulp is removed that way, the living matter remains intact and, according to a law by which nature sometimes reverses methods of nutrition to parts, I know of no reason, why the continuous integrity, which is retained through the pericementum, may not serve to continue the life of the dentine to a certain extent. But it does not matter; so long as the cementum is retained intact and the processes of nutrition are less interfered with, as it would be in the case of the use of arsenic, I do not see why the attachment does not remain the same as before the removal of the pulp.

QUESTION: Can it be used in bicuspids or molars?

Dr. WILLIAMS: It is much more useful in bicuspids than molars.

Dr. MERIAM: In the second bicuspids?

Dr. WILLIAMS: It is also sometimes successful, but even at the risk of causing pain it is better than to apply arsenic.

Dr. SEARLE: Why do you prefer orange wood?

Dr. WILLIAMS: Orange wood is very compressible, and will adapt itself better, and will fill the cavity more perfectly.

Dr. SEARLE: Would pine be too compressible?

Dr. WILLIAMS: I think not.

Dr. BLAKE: Do you cut the wood as small as the cavity?

Dr. WILLIAMS: I think it would be better to leave it a trifle larger, and to exercise care and judgment not to drive it through the apex of the root, where the former may be large.

Dr. CHANDLER: Can you be sure in this direction?

Dr. WILLIAMS: You never can be quite sure. The success is the only proof of this question.

Dr. ANDREWS: I know a case where a piece of hickory was soaked in creosote and driven home, and eight or nine years afterwards, when the crown had decayed away and the tooth was taken out, I opened the root of the tooth and found the hickory in the pulp cavity still perfect.

Dr. MILLS: I would like to say one word in regard to the operation Dr. Williams described. It seems a strange idea, almost a new idea, but of course there is not anything new among dentists. I recollect, eighteen years ago, Dr. Atkinson spoke of this method as practiced in the West; perhaps Dr. Robinson will remember. He used to tell that hickory sticks were driven against the pulp and left there. It did not pain very much, and he said he had removed the stick

and found the stump living. I have an instance in my own mouth where I had the operation performed. I was skittish about having any one cut into my teeth, and last Fall it was proposed by Dr. Richmond to insert a crown in the lateral incisor, carrying two teeth. I had seen the operation so often that with the utmost confidence I put myself in his hands. He performed the operation described by Dr. Williams; I was not hurt a particle; the sensation did not correspond to the prick of a pin; I knew simply when it was done. I feel so strongly in favor of this method that, if anything should happen, I would willingly have the opposite tooth cut off for the sake of the comfort. That is my experience.

Dr. Gaylord: I speak of a somewhat limited experience, not extending over fifty cases. I have performed the operation perhaps that number of times, and I never have had extensive pain.

Dr. Searle: Did you try it in your own mouth?

Dr. Gaylord: I have had the opportunity to verify the thing on the spot. It was done to the delight of the operator and that of the patient.

Dr. Bartholomew: In the question of crowns, the time it takes to insert one is a very considerable factor. We are all interested in this point. Occasionally we have a patient who will pay almost any price for a piece of work; but what we want, is to know which is the best method for office practice—that is, the method which comes within the reach of most patients. The Richmond crown, as it was demonstrated this morning, is too expensive for general office work; but few persons will come into an office who will pay the price of crowns of that pattern. In reference to the other methods, the questions must be asked, Which is the one that is most practical to use? What would be the amount of time to set one of the teeth? Dr. Bonwill perhaps can tell us, so that we can form some estimate of the average expense.

Dr. Bonwill: Supposing your tooth is an incisor in the lower or upper jaw, or the bicuspid, I do not think it takes longer than two hours, sometimes one hour; but never perhaps more than two hours in a superior or inferior incisor. When you come to the molars, the first molars may take two hours. I can get all the way from $10 to $15—seldom less.

Dr. Bartholomew: I would like Dr. Hurlbut to give us the time it took Dr. Buttner in setting the crown this morning.

Dr. Hurlbut: That is hardly a fair question. Dr. Buttner comes

from New York to operate before one hundred and fifty men that are to criticise; he comes away from his office, and comes here, and has no conveniences whatever compared with what he has at home. It takes him one and one half hours in his own office, but here he was two hours in selecting a tooth from what teeth we had in the city and he had brought, and then he was not satisfied. He was busy perhaps three hours this morning, counting all.

Dr. Bonwill: One point still! Some persons asked how I would remove the crown when placed on, and when it had become loose. There is no way except to take a corundum wheel and cut through the crown as through glass; also in cases of repair; but if you take a pin of proper size, there is seldom any case necessitating that. The teeth we are making are made interchangeable; you have nothing to do but to remove a portion of the amalgam which had gone into the base of the crown, adjust a new crown and put it on in the same manner as a new one.

Dr. Searle: I can readily see the advantage of cutting off the crowns of teeth, but as to the method of driving the pulp to the end of the roots, I remember very well of a man who told me after such an operation he would swear that a broom-stick was run into his head.

Dr. Coolidge: Dr. Clark, having just left, did not have the opportunity to make an announcement in regard to the meeting of the American Dental Convention, which meets on the second Tuesday in August. Allow me also to remind you of the meeting which takes place the coming Fall, the first Tuesday in October, namely, the meeting of the N. E. Society, at Providence, R. I.

Adjourned.

Third Day.

The session opened at 8 o'clock, with a clinic by Dr. Bonwill in crown-setting. This was followed by the reading of papers by Drs. J. A. Robinson, E. P. Brown and C. F. Bliven, all of which we expect to publish at an early date. Thus closed one of the most enthusiastic, earnest, and fruitful meetings that it has ever been our pleasure to attend—to report which. in any complete sense, is an imposibility. One must have been present to witness the many little things that are always collateral on such occasions, and listen to the spoken words in order to even approximately appreciate its value. The constant attendance of an unusually large number through the session—with the weather almost unbearably hot—evinced the untiring interest and appreciation of the members, and the hearty vote of thanks at the close to the distinguished gentlemen who had done so much to insure the success of the meeting, was something more than a mere formality.

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ORIGINAL COMMUNICATIONS.

A HISTORY OF DENTISTRY.

BY GEORGE H. PERINE, D. D. S., NEW YORK.

[Continued from page 205.]

THE EARLY DAYS OF THE SPECIALTY IN FRANCE.

That to France is due the credit of having made more rapid and direct professional advancement than any of her European neighbors, is a fact which must be conceded from the reference made in the succeeding pages to the immense and valuable improvements in the method of practice, instruments, and valuable contributions to the literature of the specialty which has emanated from the land of the Gauls.

As early as 1580, students in dentistry were admitted to the University of France, though we fail to find any record of the existence of a chair at that time. One has, however, since been established. At the opening of the sixteenth century surgery, although in a somewhat degraded state, began to make some progress toward improvement. The connection of barbers with a science of such importance did not serve to elevate it in the public mind, or to impress with any degree of confidence those unfortunates who were obliged to submit

to operations of a minor character, which were generally performed by barbers or other incompetents. In 1505, however, an improvement was made through a treaty entered into between the physicians of Paris, and the barbers, by which the latter were conditionally admitted members of the faculty, and dignified by the title of "*Tonsores Chirurgici.*"

Later, the surgeons issued a decree compelling the barbers to confine themselves to the performance of only minor operations, but it was not until 1700 that persons desiring to practice the specialty of dentistry were compelled to pass a regular examination. About this time Fanchard (to whom we will refer at length hereafter), writing upon the subject of dentistry, expressed himself as follows:

"The most celebrated surgeons having abandoned this branch of surgery, or having but little cultivated it, their negligence gave rise to a class of persons who, without theoretical knowledge or experience, practiced it at hazard, possessing neither principles or system. Nor does the state of things seem to have been any better in England, while in other parts of Europe it was as bad, or even worse."

Urbain Hemard, of Lyons, one of the early French writers, published in 1582 a work entitled "*Researches upon the True Anatomy of the Teeth, their Nature and Properties.*" It was a production of decided merit. In it the question whether the teeth could be considered true bones, and, if not, in what particulars they differed from them, was considered. It also described most accurately the circumstances under which the teeth most rapidly undergo a change, and recommended methods of treatment equally as valuable as those proposed by the dentists of the present day.

Ambroise Paré has been very justly termed by French writers the "Father of Modern Surgery." He was born at Saval, in the Province of the Main, in 1509. He first practiced his profession in the hospitals of Paris, and afterwards in the army, to which he was attached during several Italian campaigns. In 1552 he was appointed Surgeon in Ordinary to King Henry II. He held the same office under three successive monarchs. He was a Protestant, and having rendered great professional service to Charles IX., he was indebted for his life to the friendship of that king, who, on the eve of the horrible massacre of St. Bartholomew, sent for him and secreted him in his private apartments, where he remained during the massacre. He died in 1590. His complete works were published in 1582, and a translation into English of that treating exclusively of surgery was

made by Thos. Johnson and issued from the press in 1634. In his writings, he referred to the transplantation of teeth, and also described several palatine obturators of very ingenious construction. He related an incident of a lady who, having lost a tooth, had it replaced by one extracted from the mouth of her maid. To this practice Parê strongly objected, however, expressing a preference for artificial teeth of ivory or bone, secured by gold or silver attachments. He favored the scarifying of the gums in cases of difficult dentation, and his first experiment of this character was upon his son. He described the teeth as being harder and more solid than other bones, and believed that they continued to grow during life, in favor of which theory he advanced the following argument: "If such were not the case, they would be worn and wasted away by one another through continued use in chewing. This may be perceived by any who have lost one of their teeth, for that which is opposite to it becomes longer than the rest from having nothing to wear it down." Parê was the inventor of several dental instruments much resembling those now in use, and to him the specialty is much indebted for the presentation of many valuable and original ideas; and it was doubtless owing to the beneficial influence exerted upon the profession by him that its advancement became so steady, and its expansion so marked that, within a few years after his death, we find practitioners devoting their attention to particular branches of the science of medicine. The appellation of Surgeon Dentist is for the first time met with in France in 1622, when it was conferred upon Gillies and others, but it was not, however, a title generally recognized for several years thereafter. Gillies was the author of a work entitled "*Remedies for Toothache.*"

In 1633 a similar work appeared. It was entitled "*Remedy against Toothache,*" and the name of its author was Dupont. It advocated the extraction of diseased teeth, and the substitution of those taken from a living or dead subject in their place. Dupont claimed to be the first to transplant teeth, but, as we have previously stated, Parê practiced the method half a century before. Perhaps, however, to Dupont is due the credit of originating as a remedy for toothache the extraction and immediate replacement of the tooth in the socket.

Early in the seventeenth century one Pierre Forrest published a treatise on the teeth, in which he expressed an opinion that the manufacture of artificial teeth from ivory was likely to prove a dangerous blessing. He believed their insertion by means of gold would cause violent inflammation of the gum and other portions of the mouth,

from which the general health of the patient would be likely to be severely affected. For his ability to cure diseases of the maxillary, Forrest was somewhat noted, and he is also credited with having made an improvement in the forceps. Like many of the practitioners of the present day, he possessed a hobby which he persistently rode. He firmly believed that there could be produced a medical compound which would cause the painless expulsion of the teeth from the jaws, and he devoted many years in a vain endeavor to discover this dental philosopher's stone.

Prominent among French dentists at the beginning of the eighteenth century stood Landemiey, of Paris. Indeed, so well established was his reputation that he was chosen to perform operations upon the teeth of Phillip V., of Spain, and in 1723 he was appointed dentist to the king of Spain.

PIERRE FANCHARD, who practiced dentistry in Paris in the eighteenth century, was one of those masters in science whose superior abilities enable them to prepare in the brief space of their active lives works which serve as the basis for much which is performed by those who follow them for several successive generations. He found the dental specialty only a partially developed art, but left it a comparatively well-defined branch of the medical profession. His method of practice can not, of course, be compared to that of the present day, yet it can not be denied that it was conducted upon scientific principles, and was much in advance of his age. Audibran said in reference to him: "It is impossible to explain with more clearness, or to demonstrate with more evidence than did Fanchard, the precepts of an art which partakes at the same time of medicine and surgery." His work, comprising two volumes, and entitled "*The Surgeon Dentist*," appeared first in 1728, and the third and last edition was published in 1786. It was this production which gained for him the title of the Father of Modern Dentistry. Fanchard presented a feasible plan for obviating defects in the palate, and he gave illustrations of no less than five kinds of obturators for this purpose, which are acknowledged to be decided improvements upon those recommended by Parê, and it is generally conceded that the combination of a palate-plate, with artificial teeth, originated with him. To Fanchard is due the credit of exposing the fallacy of the dental worm theory. After a careful examination of the teeth with the microscope, he fearlessly avowed that these creatures had their existence only in the imagination.

In the year 1735 a member of the French Academy discovered

caoutchouc (India rubber), which has since proved a material of great value to the specialty.

The works of Robert Bunon were a decidedly valuable acquisition to dental literature. His "*Prejudices Concerning the Diseases of the Teeth of Pregnant Women*" appeared in Paris, 1759, and "*Diseases of the Teeth*," 1743. Bunon disproved the popular superstition that there was danger attending the extraction of the canine teeth, and explained that their nerves had no connection with the eyes, as had formerly been believed. He was born at Chalons, in 1702, and died at Paris in 1748.

Between the years 1756 and 1764 M. Bourdet, a prominent dentist, published in Paris several works on dentistry. The most valuable of these was entitled: "*Researches and Observations upon Every Part of Dentistry.*" Bourdet was successful in adjusting artificial teeth, and made some valuable improvements in many of the instruments commonly used in his time.

M. Jourdain, a contemporary of Bourdet, contributed to the literature of his profession three able treatises. The first, which was issued in 1761, bore the title of "*A Treatise on the Depositions in the Maxillary Sinus, Fractures and Caries, with Reflections on all Operations of the Art of Dentistry.*" His next was called "*An Essay on the Formation of the Teeth, Compared with that of the Bone,*" and appeared in Paris in 1766. His last work comprised two large volumes, and was called "*Treatise on the Diseases and Surgical Operations of the Mouth.*" It was published in 1778, and is still considered a work of considerable practical value. Jourdain's knowledge and rare ability gained for him an elevated professional position, and he was made a member of the College of Surgery.

The first lever for extracting teeth was introduced into practice by De Lesluse, in France, in 1780.

The pen of Delabarre has given to the profession much valuable information. His "*Treatise on the Mechanical Part of the Art of the Dentist*" was published in Paris in 1820. It was in two volumes and, at the time of its issue, conceded to be a work of much merit. Other productions of his appeared between the years 1806–26, and to their author is ascribed the recommendation of rubber as an excellent material from which to manufacture dental plate, and it is claimed that he employed it for that purpose about 1850.

[To be continued.]

EDUCATION.

BY DR. J. A. ROBINSON, JACKSON, MICH.

[Read at the Springfield Union Meeting, June, 1883.]

In your announcement, I see one of the subjects is "Education." Now, there are so many ways to educate people, and we obtain our education through so many different channels, that I thought I would suggest one or two of the various avenues of learning outside of the schools and colleges. I have known a good many well educated men who have had very few advantages in what may be termed school education; they have got their education from nature, through observation and reflection. Elihu Burritt belonged to this class of self-educated men. Daniel Webster was an idler while in college, and he went through with the classics after he removed to Boston and began to have some political aspirations, because he felt the necessity of more book culture. But he had sat for whole days, before that time, under a favorite tree contemplating and studying nature. Patrick Henry, in his youth, spent his time in hunting and fishing until he was called accidentally in court to attend to some business that was so unpopular that those learned in his profession thought it too contemptible to prosecute. But all these days and years he had been receiving instruction from nature, who is the original, the purest and most reliable teacher. Nature is always pure and true, but books are reflections of men's minds, and are often colored by their prejudices and preconceived opinions. Nature's school is always pleasant as well as instructive, and produces the highest development because it is based on reflection. The plays of boyhood quicken the understanding. We learn to overcome the law of gravitation by throwing a ball, and time and space by running a race; and so education through the medium of nature becomes art. The reflective faculties are also the base of all our inventions; they are the thinking properties of the mind forced upon us by our necessities. They make all our improvements in dentistry, they heal all our diseases. They awaken the love of truth, and develop all our heroes and statesmen. It was these that gave us our independence and put down the rebellion. This it is that makes labor conscientious and thorough. Observation is the lever, and reflection the fulcrum that moves the world. Nature is the school-master and the universe the school-room. This combination turns the heroic practice of dentistry into the conservative by love, until we save the natural teeth by the same secret power the Creator exerts when the organs are produced. Next to nature is the associa-

tion and the convention. We arrive at truth in talks and discussions more readily than by reading. The charm of oratory, with the exhibition of appliances, fixes things in our minds as permanently as illustrations in the magazines and newspapers. In meetings like this, we get the combined wisdom and experience of the State. We get at the real things. There is something when we are alone that hinders our coming up to our ideals as rapidly as we do when we commune with minds that are interested in kindred topics. The cold steel of our understanding is warmed by the hammer and flint of our neighbors, as the sculptor and painter is warmed at looking at the perfect models of nature.

The ideal thing is the real thing, after all, and the real man is the man who conforms to what he calls his ideal, and the ideal is the real that was before he realized the fact. The ideal tooth grows out of the fact that there is a real tooth, and the perfect artificial denture grows out of the fact that there is a perfect denture. The perfect fillings we see to-day grow out of the fact that such men as Harwood and Tucker and Bemis and Hudson have lived and left real examples of beauty and excellence as ideals for us to follow. So the ideals are always the reals that precede us. What one man has done another man may do by imitation, and we all imitate nature—not, perhaps, every man, but some man. Our ideal possibilities are because some real thing has been made possible. So, when we mention the names of our distinguished men and honor them, we honor ourselves because we honor our possibilities. When we see a really great man, we say this is our possibility; this is what we are as a divine whole. So, in conventions, when we talk of those who gave their lives to their profession and have passed on—when we contemplate their lives and labor performed and success achieved, we see our real selves in their ideals or reals they have left us, as those who shall come after us will see themselves in what we are doing here to-day.

Very few great men live to see their true greatness, there are so many obstructions to overcome in every profession. One of the greatest is professional jealousy. Jealousy is a crooked road that leads us through thorns and briers of deceit and dissimulation to the uncomfortable throne of malice and hate. This grows partly out of the fact that the world is exacting so much of those who follow professional life that we cannot live our true selves. We feel obliged to turn toil and genius into money, to keep pace with the demands that are laid upon us. When we do turn toil and genius into money, we

always give a fair exchange, for the good dentist can never be in debt to his patrons; he always gives more than he receives. The trouble is, that we cannot fathom the greatest depths of genius while we are in poverty. When a personality is marred and defaced, the person who can restore it can never be overpaid. The man of genius can never be satisfied with the mere utilitarian things of this life. Then our present civilization demands something higher than food and clothing. We could not do our best under such circumstances. The soul that is satisfied with a *stand still* does not deserve our affection. We should have had no America if Columbus had had no ideal,—and the real America existed ages before Columbus contemplated his voyage; but his soul saw the continent, and was never satisfied until his eyes rested on the green hills of the Bermudas. Columbus was willing to sacrifice his life for his ideal. In the lower orders of creation, there is no such jealousy existing as between the animal creation. Where there is no ideal there can be no progress. The daffodil, the tulip, and the snow-drop remain the same through the ages. The tulip comes without jealousy to cheer us in the spring-time, and the snow-drop remains to give us hope and courage for the winter. This *jealousy* grows out of intensified selfishness and false reasoning on the principles of political economy. When the world has learned that the supply of a thing makes the demand for a thing, and not the demand a supply, and that the supply, like the real, must always come *first*, they will walk more in harmony with each other. The supply of good dentistry makes the demand for the good dentist. as much as the supply of good dental materials makes the demand for them. It is the same in all the improved implements of industry and machinery —the mowing and sewing machines, and tools of trade, including money. When the new improvement first comes it may jostle and disturb the old for a time; but the survival of the fittest is the great law in nature, and the expansive nature of our civilization, and the increase of our population, and the laws of business gravitation will restore harmony in society and always keep pace with our wants and real needs.

The difference between the educated and uneducated portion of humanity is fully illustrated by a view of Franklin Square, New York. Take the outside street in front of Harpers' Publishing House and compare it with the inside. Let us see what we find outside. We find the rag-picker hooking up a dirty piece of rag, blended in the common filth of the street. It has no significance above the pennies

it will bring to sustain life; but the person who is inside, and the paper-maker, look beyond the filthy rag, and see it made into paper as pure and white as the snow, and the name of God and Immortality written upon it. Alas! how many rag-picker dentists there are abroad in the land—dentists who see nothing higher than tooth extraction, and rubber plates and amalgam fillings, and the few pennies that lay behind them to keep them from starvation. This rag-picker is raised only a step above a vegetable life; but the paper-maker and the book-maker see something infinitely higher and grander in the transformation of the rag into paper and books. They see in the dirty rag the alphabet teaching the child to read, and anon it is teaching chemistry, and history, and philosophy. They see it going on a mission to foreign lands, and giving us our constitution and laws. They see it measuring the crust of the earth, and giving us the psalms and the psaltery. They see it recording deeds and possessions that make us vain and proud, but which no more compare to real deeds of kindness and benevolence than the faintest glimmer of a single star to the blazing glory of the sun. They see by the eye of faith in that dirty piece of rag, and in the rag-picker also, a transformation and resurrection almost as great as that recorded in the New Testament, where it tells of the souls of those that are washed in the river of life and made fit to dwell with the angels and God forever. Nature is constantly impressing us with her invisible forces, only of a different order, like the invisible forces that grow the plants and the flowers; but we must not forget that these forces are *real* forces, for how can anything be impressed without something to impress it? or how can impressions be made without there is something to impress? Nature impresses herself on those whose natures are so supple that they can receive and retain impressions. Nature is one vast stereoscope, and everything we realize is daguerreotyped upon the mind. We sit musing within ourselves, and call it thought, when, in fact, we are only looking at impressions indelibly stamped upon us by this invisible hand of nature years before we could appreciate its meaning, or had mental culture enough to understand its significance. We can sit in our homes a thousand miles away and see the village where we were born. We can see the very house and the furniture, and the well; we can see all the cattle on the farm, that have been dead for more than fifty years; we can see the old stage coach that gave place to railroads long years ago—see the familiar face of the driver, and hear the veritable crack of his whip, and see the sort of magic twitch of the arm

that produced the sound; we can see the gray hairs of our father blown by the wind as he drew water from the well; and our dear old mother, with a clean white apron, standing at the churn, or making a cake for the boys, and hear the very crackling of the brush in the oven, and almost feel the impatience at its dullness of heat so that the cake could be baked and eaten; we can see all the little girls we loved when we were a boy, and feel all our little disappointments over again, as we turn over this stereoscope of the mind on which they are indelibly printed. These retrospective happinesses were once real happinesses and ideal remembrances, because they were real once; and the ideal always looks towards improvement. The person who is thoroughly satisfied, is a sort of Rip Van Winkle fellow, and is either just asleep or fast going to sleep. The visionary man is better than the stand-still man. He may be an adventurer, but the adventurers are looking toward the new, and their minds are never satisfied. They have received impressions from the far away and are called prophets. They are the persons who build railroads, and towns, and cities for humanity to people a continent.

Such persons are always educated persons, though they may have never seen the inside of the school-room. They behold afar off all the reals, and baptize them with the name of ideals. We can never reach ideals by compromises; the ideal compromise never makes real progress; they improve sometimes upon the thoroughly bad, but cannot reach perfection. Nothing that *will do*, but which you wish you had done better, can ever fill the perfect ideal, because it has not before it the real. It is just the same with the educated dentist.

Our ideal civilization is only that civilization that corresponds nearest to that real civilization laid down in the New Testament and illustrated by the real life of Jesus. The ideal light is the real light of the sun. It was first imitated by man in burning the pine knot and the bon-fire, that gradually grew to the tallow candle, and from thence to kerosene and gas; and finally to the electric light. And the ideal life is only a correspondence to the real life that is within us. This real life that we call the ideal life thrusts aside all abuses, takes all the poisons, and administers them to our health, and actually saves teeth without extraction till death; supplies artificial dentures that are harmless, that come within the reach of all the unfortunate, and so come nearest the divine. The real is within us, or we could not catch a glimpse of the ideal, and it is by this mode of reasoning, which is logical and not sophistical, that we reach over the river and take hold of the immortal life and the real hand of the Infinite Father.

INSTRUMENT MAKING.

BY DR. C. F. BLIVEN, WORCESTER, MASS.

[Read before the Massachusetts and Connecticut Valley Dental Societies, at Springfield, Mass., June, 1883.]

Instrument making appears to have become a source of great profit to those engaged in it. They appear to be striving to outdo each other in producing articles for which they can demand a ready sale, utterly regardless of their practicability. It is often remarked by those engaged in this pursuit, that the dentist cannot afford to make his own instruments. This may be true of those who lack the knowledge and skill to do so and who can purchase just what they desire.

Following in the footsteps of our predecessors deprives us of progression; to advance in our profession, the dentist must invent his own theories and organize his own systems; to enable him to perfect his original methods he must possess the skill to produce by his own labor the necessary instruments and appliances. How many offices are there free from a large collection of articles never used, many of them the result of excellent ideas that require only the skill of a practical dentist to make of them valuable assistants. The fortunate possessor of skill will make few purchases of *useless* articles, even if he is assured by the gentlemanly salesman "that it is strongly recommended by Dr. —— as the only successful appliance ever sold." After several unsuccessful trials, it is given up in disgust by the unfortunate purchaser who again returns to his former method of practice, or takes it upon himself to study out an idea and, if he constructs only a portion of it, by giving his personal attention to its detail, he finds it a successful and economical experiment. As good an illustration as I am able to give, is my own experience with the flexible drills, introduced by Dr. E. Palmley Brown,—an excellent idea, worthy of being executed with greater care and skill by the manufacturer. Many of the same number are so variable that no reliance can be placed upon their size in ordering them; only one of what may be supposed to be No. 3 proved of any value; in fine, only one instrument out of five proved of any value—too much temper in one, too little in another, and flaws in the remaining two, proved them failures, after two or three trials each.

The two I exhibit here were made in about an hour and have become old veterans in service, receiving many wounds and much abuse—from patients principally—but appear to possess vitality and

strength for many more months of usefulness! After my experience with these and many other devices I find it more economical to make whatever I possess the skill to construct. One should not, however, become bigoted, but accept any device they may be able to comprehend, considering the patient's comfort, time saved, and its practicability.

The Dental case once well supplied, it takes only a few hours each month to keep up its standard. With a little experience and a proper outfit—the cost of which need not exceed twelve or fifteen dollars—it is surprising how easily and quickly many things are accomplished.

While I prefer a bituminous and charcoal fire when it can be used, gas is more convenient for small instruments, but makes steel hard and brittle; it is claimed by many that gas has no detrimental influence upon that portion of the steel the flame is in contact with, but that it has upon the part heated beyond the flame. There may be something in this, for springs brazed together never break at the brazing, but at a point a short distance either side of it and apparently the portion heated *by*, but not directly *in*, the flame.

It is of the greatest importance that a grade of steel be selected best suited to the purpose it is designed; and for instruments one that is strong, dense and will not take a fine temper is requisite. Jessup's steel works easily and runs more evenly than Stubb's, but will not hold an edge as well on fine instruments. The Sheffield razor steel is far more suitable for excavators and chisels than any other I have been able to obtain. Crome steel, noted for its great strength, has been highly recommended to me by the President of the Company who manufactures it, but it cannot be obtained except by special order in bars small enough for instruments. It is also said of this steel that it is not injured by over-heating. This, together with its strength, are certainly two very strong points in its favor.

It is nearly impossible to forge some of the smaller instruments while red hot; there is, however, very little danger of breakage if done upon a very hot anvil, striking rapidly the least number of blows necessary to form it into the required shape. A little extra filing is preferable to heating and hammering too frequently. When the shape is obtained, the instrument should be draw-filed and sharpened before it is tempered. A knowledge of tempering can only be obtained by close observation and experience. As one must be governed wholly by the purpose for which the instrument is designed, numerous experiments have convinced me that for general use there is nothing better

than a saturated solution of chloride of sodium (to which a little flour may be added), heated to a temperature of about 65° Fah. The instrument should be warmed and dipped in the liquid, previous to heating to a cherry red,—and that degree of heat maintained until the salt and flour are melted. It must then be plunged instantly into the preparation; for instance: The instrument may be held in the flame at an angle, and a long large-mouthed bottle filled with the solution raised quickly up to it, moving it away as soon as the point of the instrument is in the solution. This method prevents the air from coming in contact with it and if properly done will come out white as far as the instrument is hardened. One or more sides of it must be polished with emery-cloth if the temper is to be drawn upon hot iron. This may be omitted where several are to be drawn at once, in which case several may be bound together and suspended in mercury, heated to a temperature that will draw them to the temper required. No time must be lost in removing them from the mercury and plunging them into the bath; for this purpose water heated to the temperature previously mentioned is to be prepared, as it leaves the instruments in a cleaner condition for finishing. This may be handily accomplished by placing them firmly in a vice and drawing around them strips of emery-cloth from one fourth to one inch in width upon which a few drops of oil are placed, removing the file-marks with No. 2 and following with No. ½, 0 and 00 emery-cloth, completing the finish with oiled crocus-cloth. A higher polish may be obtained with rouge, but it is of no practical advantage, as it soon disappears after using the instrument.

Nearly every dentist's laboratory contains thc necessary outfit, with perhaps a few necessary additions. The burner exhibited is the best I have ever seen, not only for instrument-making but for general laboratory use; it is adjustable, sold at a reasonable price and may be obtained of H. C. Earle of Worcester. When properly adjusted and surrounded with a cone made of fire-clay and bran, a piece of steel one-fourth of an inch in diameter may be heated to a cherry red, in a few moments, to the length of four or five inches. A tin-smith's furnace with proper dampers, where a strong draft can be obtained, is an excellent and inexpensive forge; it may also be used as a stove in small laboratories, and for other purposes. Two hammers are required, one having a round and one a flat face, together with two anvils, one 1½ x 4 inches, the other ½ or ¾ of an inch square, with one round and one square stake. An excellent anvil for the larger size would be one

with a hole in its center, about three-fourths of an inch in diameter, as this would bring the fire and work to its nearest proximity and aid in keeping both hot. A set of Grobet's die-files, smooth cut, with a 7-inch half-round second cut, a 12-inch flat smooth, a 7-inch equalling smooth, 6-inch narrow pillow smooth, 6-inch half-round smooth, 3-inch half-round smooth, and a 3-inch half-round dead smooth, constitute a very desirable set.

Instrument manufacturers are very reluctant to furnish serrating files or give information where they can be obtained. They can be purchased, together with the steel of any grade or size, of Peter Frassé, No. 95 Fulton street, New York.

EDITORIAL.

THE AMERICAN DENTAL ASSOCIATION.

Being unable to attend the annual meeting of the American Dental Association for 1883, held at Niagara Falls on the 7th, 8th and 9th of August, and having at our disposal—by the mistaken policy of the Association—but a meagre report of the proceedings, we are not able to give our readers the advantage of an early report. From various sources we learn that the meeting was largely attended and possessed many features of interest; in short, that it was a "good meeting."

By a "mistaken policy" we refer to the "exclusive right" which the Association claims to all the papers read before it, denying to any journal the privilege of printing the same, or to the author thereof offering the same for publication, until it appears in the tardy proceedings of the Association's publication. Could the proceedings be edited and issued before they became stale, this objection would not seem so self-evident as is the case in the past history of such publications; but, by the time such reports are usually issued, other things have arisen which demand the attention of the average editor and the profession as well. The profession generally having learned through indefinite and unreliable sources, in the meantime, some *half-truths* regarding the meeting, have not the disposition to undertake the careful perusal of the voluminous proceedings when, some months afterward, they come to hand. Fresher material is at hand. Thus it is that the profession at large probably are less acquainted with the work

of the American Dental Association—in detail at least—than almost any other society in the land. Very few, indeed, but members, ever see the Association's publication, and, for the reasons given, the journals simply *cull* a report at best. As at present conducted, the publication is of interest chiefly to members, when, if live journals were permitted free access to the papers and discussions, the impress and influence of the Association would be much more potent and widespread. Some interesting resolutions were passed, of which we give the following:

Dr. Peirce offered the following, which was received with applause and unanimously adopted:

Resolved, That the American Dental Association deems it adverse to the interests of the dental profession for any State Board of Examiners to confer a title or degree of any nature.

. . . .

Resolved, That the interests of the profession and advanced dental education both demand that all dental educational institutions shall require that every student, before being admitted to examination for the degree of doctor of dental surgery, shall have taken two full courses of lectures.

This resolution caused a lively discussion, in which Dr. W. C. Barrett, Dr. Stockton, Dr. Buckingham, Dr. Pierce, Dr. B. G. Marklein of Wisconsin and Dr. Allport of Chicago participated. The resolution was unanimously adopted.

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IN MEMORIAM.

The chair of our president is draped with the insignia of grief and mourning, indicating that its proper occupant is not with us, and that this Association has met with bereavement.

Dr. William H. Goddard, president of this Association, is no more. He died at his home in the city of Louisville on the morning of March 4, 1883, after a prolonged illness and great suffering.

Aside from the fact that it is the first officer of this Association whose loss we mourn, the character of our friend and colleague—as a man—was such that this Association simply honors itself by giving expression to its feelings of sincere and heartfelt sorrow at his death, profound respect for and appreciation of his many noble traits of character. He was the personification of honor and integrity; conscientious and exact—even to apparent sternness—in the fulfillment of duties either assigned to him or voluntarily assumed; modest and

unpretending in all his stations of life, yet possessed of that manly independence of thought and opinions which enabled him to become on important occasions a valuable counselor. Among his peers he was positive and strong in asserting his convictions, yet never in an arrogant or overbearing manner. In his exterior, our friend was not endowed by nature with that smooth and polished suavity of manner and address which attracts and charms at first sight, yet his excellence and strength of character soon won for him friends and honor. With all his apparent sternness of manner, he was at heart exceedingly kind and gentle. Honors came to him unsought, and whatever stations of life he occupied, or trusts administered, he was honest and faithful. His death is mourned by many who have lost in him a guardian, trustee, adviser, or friend. In his family circle and among his more intimate friends, he was kind and affectionate. He was at times quite humorous, and enjoyed an innocent practical joke right well.

We all know what he was to the American Dental Association. For fourteen successive years its treasurer, until finally called forth to take the gavel and be its president, many of us have reason to remember him as an impartial but exact and unflinching officer. In his profession he strove to be abreast of the times. There was no standing still or retrograde movement with him. He was always up and doing. His career in life has been an interesting and beautiful one. It would furnish material for an extended obituary that has been written by able and loving friends and nothing that might be said here would be needed. In token of our affectionate regard for our departed frater, let a page of our records receive this our memorial, and the expression of the sincerest sorrow of this Association at his demise. Let his widow and family receive the assurance of our sympathy and condolence with them in their bereavement and distress, and our best wishes for their future welfare.

J. Taft,
F. H. Rehwinkel,
G. W. McElhaney,
Committee.

On motion of Dr. McKellop, of St. Louis, it was voted to inscribe the resolutions upon a memorial page in the transactions, and to send a copy to the family of the late Dr. Goddard. The vote was taken by rising.

Resolutions were also passed relating to the deaths of Drs. M. H. Webb and Wm. H. Allen.

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Dr. Pierce, chairman of the committee on place of next meeting, reported Washington, St. Louis and Saratoga. The Association proceeded to select the place by ballot. On the second ballot Saratoga was chosen, receiving twenty-nine out of fifty-four votes. The following officers were then elected:

President—Dr. E. T. Darby, Philadelphia.

First Vice-President—Dr. C. S. Stockton, New Jersey.

Second Vice-President—Dr. T. F. Moore, South Carolina.

Corresponding Secretary—Dr. A. W. Harlam, Chicago.

Recording Secretary—Dr. George H. Cushing, Chicago.

Treasurer—Dr. George W. Keeley, Ohio.

Executive Committee—Drs. A. G. Friedrick, New Orleans; S. G. Perry, New York; W. N. Morrison, St. Louis.

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At the meeting of the National Association of State Dental Examiners, held Tuesday afternoon in the Cataract House, the time and place of next meeting was left to be fixed by the officers of the Association, and a cordial and earnest invitation was extended to all state boards to join this Association and co-operate in its work. The transactions of this session will be published and furnished to the various state boards. A draft of a law was made to be recommended to the various state societies desiring to secure such legislation, embodying the features which experience has demonstrated are most essential. These features are that the board should be appointed by the governor of the state from candidates furnished him by the state dental society; that there should be a perfect system of registration, and that the violation of the law should be deemed a misdemeanor punishable by a fine of not less than fifty dollars nor more than two hundred, or confinement for six months in the county jail.

. . . .

The report of the prize committee read, as follows: "Your committee to whom was assigned the duty of deciding upon the merits of essays upon 'The Etiology of Dental Caries,' offered for a prize of $200, which was last year appropriated by this Association for the purpose, would respectfully report that but one essay has been received, and that from the hands of Dr. W. D. Miller, Berlin, Germany. The committee have carefully read this, and while the views contained therein are not original, many of his experiments, which are in detail and made for the purpose of confirming his theory, have not been previously published. Your committee would, therefore, in view of

the original work which the author has prosecuted the past two years, the results of which are given in the paper, award to the essayist the $200 appropriated for the purpose."

We are informed that the report of the "prize committee" was, after considerable discussion, adopted, with only a single dissenting vote and when a full delegation was present. We are also informed that on the last day of the meeting, when only about twenty members were present, this vote accepting the report was reconsidered and the recommendation of the committee was rejected. We are not informed as to the reasons assigned for this action, but on general principles this action has on its face a "*bad look*." Some very potent reasons must be presented before a minority can thus at the close of a meeting, in the absence of the majority, undo the work of a preceding session without laying themselves open to a charge of at least unmanly unfairness, if not to something more reprehensible. It is exceedingly difficult to conceive of a case that may warrant such action. If we correctly understand the facts, the conviction can hardly be resisted that there is "bad blood" somewhere that will react upon the unfortunate possessors, sooner or later, in a manner not entirely to their professional credit, or honor as gentlemen. We only hope that we misunderstand the case.

A VARIETY OF LEPTOTHRIX DISCOVERED BY DR. W. D. MILLER, AND NAMED BY HIM LEPTOTHRIX GIGANTEA.

Dr. Miller had the kindness to send us a copy of the *Berichte Der Deutchen Botanischen Gesellschaft* containing a monograph about this parasite; we give an abridged translation.

"In summer last year, Dr. Möller of the veterinary school at Berlin brought to me a dog suffering from Riggs' disease (pyorrhœa alveolaris), to have its teeth examined. On the scum covering the teeth there was a luxuriant development of a *spaltpilz* of gigantic dimensions, which was recognized in the course of the investigations as a new variety, and named leptothrix gigantea. The next question was if this organism did not also occur in the teeth of the carnivorous or phytophagous mamals, and this induced me to investigate their teeth in this direction, and I found that this fungus existed also in the mouths of sheep, cattle, hogs and horses.

The fungus appears usually in the shape of tufts or patches whose threads, similar to those of crenothrix, spread in different directions

from their point of attachment. The appearance in patches seems to be due to the fact that such little groups of threads are developed from little lumps of cocci. I have seen that in the plainest manner in the scum of teeth from the mouth of a cat. One sees a little lump of round and oval cocci from which threads of varied length radiate in all directions. The older ones are segmented into bacilli and cocci, so that there can be no doubt of a connection between these three forms. The threads of some patches vary considerable in thickness, in a similar manner as perhaps crenothrix or beggiatoa. Some are very thin, others quite thick, and there are all transitions between these two. In the finer threads no difference of basis or top can be observed, but this is well marked in the larger ones. The threads are sometimes straight, sometimes bent, and often quite regularly coiled; two or three are sometimes coiled together. In all those points leptothrix gigantea resembles beggiatoa alba and crenothrix Kühniana. Segmentation may be observed sometimes in all the threads of some patches. As in leptothrix bucalis, the threads are very often segmented into bacilli and micrococci. All these could be seen without the use of re-agents in larger threads, mainly in the upper and middle parts. Very thin threads show the segmentation already very beautifully while alive, but to see them in the finest threads, staining substances have to be employed. Sometimes one can see all three forms in the same thread, transitions of bacilli to micrococci, but finally all is resolved into cocci. In the threads carrying partitions, the components, may they be bacilli or cocci, are discharged from them and collect in little heaps.

It is a special feature, chiefly of large threads, that the components show deviations from the older forms. The bacilli and cocci often swell up and become rounded so as to press against each other. Sometimes the bacilli swell to pear shape or, when touching the neighboring cell, develop bag-like excrescences. In the older threads one can observe how the bacilli lying originally in one row, somehow become displaced, so that they no longer coincide with the axis of the thread. If now the bacilli grow in the new direction, they grow side by side, and in consequence of this occurrence the thread, which was originally uniform, appears more or less strikingly broken. We have seen that the form of cocci may originate in the first part by transverse segmentation. If such segmentations occur in small threads, the cocci show of course very small diameters; but if they occur in large threads the diameter is much larger, too. From the large cocci by

progressive divisions smaller cocci may be produced. This could best be observed in the form of leptothrix gigantea that occasionally occurs in the teeth of pigs. There occurs in the first place a transverse segmentation of a large coccus so that this is divided into two disks, but then every disk is divided lengthwise, so that the originally large coccus is divided by divisions in two directions of the space into four smaller ones. Sometimes such a formation can be seen for the whole length of a thread. At the beginning cube-shaped, those cocci afterwards become loose and move so that the original shape becomes obliterated. These divisions in two directions can often be proved only by the use of staining materials.

The spiral form occurs in the larger and smaller threads in the three modifications of spirillium, vibrio, and spirochæte. All transitions from spirillium to vibrio, and from vibrio to spirochæte, can sometimes be seen on the same thread. Very often these spiral forms show no trace of segmentation, and only by the use of staining materials can the divisions be made visible.

I presume that the fine forms of spirilla found on the scum covering the teeth in man, which has been designated until now as *spirochæte dentium*, might originate by segmentation of long threads.

Spirochæte dentium has been considered until now to be a unicellular structure, and although I took the greatest possible pains, I could not discover any segmentation in bacilli and cocci, but by applying the method of W. Zopf, I have been able to prove beyond doubt the segmentation in parts of unequal size. These pieces agree in size and shape exactly with the "dental bacterium" as observed in the mouth. To prove this segmentation, the strongest lenses with oil immersion and Abbe's illumination are needed. The specimen ought not to be colored very intensively."

A great number of very fine drawings accompany the excellent monograph.

Among our new advertisements this month we would call special attention to Dr. Waters's Electro Magnetic Flesh Brush. A personal trial of the brush satisfies us that it has merit, and we can recommend it without any reservation, mental or otherwise.

DRILLS.

Harden well your drills, chiefly the finest points of them. If the drill is well tempered, you can give a very fine edge, and if the cutting edge is arranged according to good mechanical principles, a well-hardened drill, moistened with oil of turpentine, will cut through glass with the same ease as through sheet iron. By the way, has any one tried to cut enamel with a drill moistened with a little oil of turpentine? We should think, if properly managed, it would cut much better, and with far less pressure and pain. A fine scientific arrangement of the drill point is of more importance than one might think at first sight of such a little bit of matter. Then think about the chips! Where ought they to go? You cannot cut well if you do not provide ample means for the chips to pass by the drill. Many of those flat, blunt-pointed drills not only do not cut well, but what they cut they do not remove, and thus operator and patients are annoyed. It ought to be a pride for every dentist to have a large supply of the most refined, intelligent and trained drills into which he has put more wit than into his dull brutal pluggers. Also burs, it seems to us, are often neglected from their not being kept sharp in a proper manner. A little delay in proper sharpening more than pays in the saving of time and annoyance.

SOMETHING ABOUT SMOOTHNESS OF DENTAL PLATES.

All kinds of theories have been advanced to account for the various effects of rubber plates, plates of celluloid or metal on the mucous membrane of the mouth. Several factors contribute to these disagreeable effects: The non-conductivity of the materials, the silver and mercury they contain, but far more still, as it seems to me, the defective smoothness of rubber and celluloid plates which renders them so hurtful. We all are familiar with the fact that, whenever two parts in the body touch and move upon each other, they are of extreme smoothness; in fact, so smooth, that it is very difficult for us to produce anything similar; I only draw attention to the cartilage of the bones and the outer surface of the eye-ball. With people who are forced to use artificial eyes, it has been found that these artificial eyes—though made of glass, the hardest and smoothest substance we can produce by a simple process—have become too rough for the eye-lids after only two years' wear. The liquids of the eye, the ammoniacial and saline secretions, together with the continuous move-

ments of the eye-lids, produce a superficial abrasion and roughness, even of this very hard and smooth material, so as to render it an injurious body to the eye-lids. The very same thing is important in dental plates. Why do plates lined with metal prove less injurious than simple rubber plates?

When at the Cincinnati Convention last year, Dr. Robinson, of Jackson, Mich., mentioned the good results he obtained from rubber plates lined with his soft, fibrous foil. I thought that the heat-conducting theory could not be made to agree with this fact. I was convinced from this and other facts that there was more than the heat-conducting power which comes into play, and this factor I think is to be found in the defective smoothness of the ordinary rubber plates. Metal can be polished much smoother than rubber and celluloid, and the smoothness of metal plates that are not oxidized is not impaired as rapidly as that of rubber or celluloid. Therefore, make your plates very smooth, either by covering them with some metallic lining, or by plating them with silver, gold, or anything of the kind, or by using metal altogether. M.

SELECTIONS.

THE GERM THEORY OF DISEASE.

BY PROFESSOR H. GRADLE, M. D.

[A Lecture delivered before the Chicago Philosophical Society, November 4, 1882.]

Scourges of the human race and diseases are attributed by savages to the influence of evil spirits. Extremes often meet. What human intelligence suspected in its first dawn has been verified by human intelligence in its highest development. Again, we have come to the belief of evil spirits in disease, but these destroyers have now assumed a tangible shape. Instead of the mere passive, unwitting efforts with which we have hitherto resisted them, we now begin to fight them in their own domain with all the resources of our intellect. For they are no longer invisible creatures of our own imagination, but with that omnipotent instrument, the microscope, we can see and identify them as living beings, of dimensions on the present verge of visibility. The study of these minute foes constitutes the germ theory.

This germ theory of disease is rising to such importance in medical

discussions that it cannot be ignored by that part of the laity who aspire to a fair general information. For it has substituted a tangible reality for idle speculation and superstition so current formerly in the branch of medical science treating of the causes of disease. Formerly —that is, within a period scarcely over now—the first cause invoked to explain the origin of many diseases was the vague and much-abused bugbear, "cold." When that failed, obscure chemical changes, of which no one knew anything definitely, or "impurities of the blood," a term of similar accuracy and convenience, were accused, while with regard to contagious diseases medical ignorance concealed itself by the invocation of a "genus epidemicus." The germ theory, as far as it is applicable, does away with all these obscurities. It points out the way to investigate the causes of disease with the same spirit of inquiry with which we investigate all other occurrences in nature. In the light of the germ theory, disease is a *struggle for existence between the parts of the organism and some parasite invading it.* From this point of view, diseases become a part of the Darwinian programme of nature.

The animal body may be compared to a vast colony, consisting as it does of a mass of cells, the ultimate elements of life. Each tissue, be it bone, muscle, liver, or brain, is made up of cells of its own kind, peculiar to and characteristic of the tissue. Each cell represents an element living by itself, but capable of continuing its life only by the aid it gets from other cells. By means of the blood-vessels and the nervous system, the different cells of the body are put into a state of mutual connection and dependence. The animal system resembles in this way a republic, in which each citizen depends upon others for protection, subsistence and the supply of the requisites of daily life. Accustomed as each citizen is to this mutual interdependence, he could not exist without it. Each citizen of this animal colony, each cell, can thrive only as long as the conditions persist to which it is adapted. These conditions comprise the proper supply of food and oxygen, the necessary removal of the waste products formed by the chemical activity of all parts of the body, the protection against external mechanical forces and temperature, as well as a number of minor details. Any interference with these conditions of life impairs the normal activity of the entire body, or, as the case may be, of the individual cells concerned. But the animal system possesses the means of resisting damaging influences. Death or inactivity of one or a few citizens does not disable the state. The body is not such a

rigid piece of mechanism that the breakage of one wheel can arrest the action of the whole. Within certain limits, any damage done to individual groups of cells can be repaired by the compensating powers of the organism. It is only when this compensating faculty fails, when the body cannot successfully resist an unfavorable influence, that a disturbance arises which we call disease. This definition enables us to understand how external violence, improper or insufficient food, poisons and other unaccustomed influences, can produce disease. But modern research has rendered it likely that the diseases due to such causes are not so numerous as the affections produced by invasion of the body by parasites.

Of these a few are known to be animals—for instance, the trichina, and some worms found in the blood in certain rare diseases. But the bulk of the hosts we have to contend with is of vegetable nature and belongs to the lowest order of fungi—commonly termed *bacteria.*

Special names have been given to the different subdivisions of this class of microscopic beings—the rod-shaped bacteria being termed *bacilli;* the granular specimens, *micrococci;* while the rarer forms, of the shape of a screw, are known as *spirilla.*

Bacteria surround us from all quarters. The surface of the earth teems with them. No terrestrial waters are free from them. They form a part of the atmospheric dust, and are deposited upon all objects exposed to the air. It is difficult to demonstrate this truth directly with the microscope, for in the dry state bacteria are not readily recognized, especially when few in number. But we can easily detect their presence by their power of multiplication. We need but provide a suitable soil. An infusion of almost any animal or vegetable substance will suffice—meat-broth, for instance, though not all bacteria will grow in the same soil. Such a fluid when freshly prepared and filtered, is clear as crystal, and remains so if well boiled and kept in a closed vessel, for boiling destroys any germs that may be present, while the access of others is prevented by closure of the flask. But as soon as we sow in this fluid a single bacterium, it multiplies to such an extent that within a day the fluid is turbid from the presence of myriads of microscopic forms. For this purpose we can throw in any terrestrial object which has not been heated previously, or we can expose the fluid to the dust of the air. Air which has lost its dust by subsidence or filtration through cotton has *not* the power of starting bacterial life in a soil devoid of germs. Of course, the most certain way of filling our flask with bacteria is to introduce into it a drop from another fluid previously teeming with them.

In a suitable soil each bacterium grows and then divides into two young bacteria, it may be within less than an hour, which progeny continue the work of their ancestor. At this rate a single germ, if not stinted for food, can produce over fifteen million of its kind within twenty-four hours! More astounding even seems the calculation that *one* microscopic being, some forty billion of which can not weigh over one grain, might grow to the terrific mass of eight hundred tons within three days, were there but room and food for this growth!

During their growth the bacteria live upon the fluid, as all other plants do upon their soil. Characteristic, however, of bacteria growth is the decomposition of any complex organic substances in the fluid to an extent entirely disproportionate to the weight of the bacteria themselves. This destructive action occurs wherever bacteria exist, be it in the experimental fluid, or in the solid animal or vegetable refuse where they are ordinarily found. It constitutes, in fact, rotting or putrefaction. The processes of decomposition of organic substances coming under the head of putrefaction are entirely the effect of bacterial life. Any influence, like heat, which kills the bacteria, arrests the putrefaction, and the latter does not set in again until other living bacteria gain access to the substance in question. Without bacteria, no putrefaction can occur, though bacteria can exist without putrefaction, in case there is no substance on hand which they can decompose.

No error has retarded more the progress of the germ theory than the false belief that the bacteria of putrefaction are identical with the germs of disease. The most contradictory results were obtained in experiments made to demonstrate on animals either the poisonous nature, or, on the other hand, the harmlessness, of the fungi commonly found in rotting refuse. But real contradictions do not exist in science; they are only apparent, because the results in any opposite cases were not obtained under identical conditions. The explanation of the variable effects of common putrefaction germs upon animals is self-evident as soon as we admit *that each parasitic disease is due to a separate species of bacteria, characteristic of the disease*, producing only this form and no other affection; while, on the other hand, the same disease can not be caused by any other but its special parasite. It can be affirmed, on the basis of decisive experiments, that the bacteria characteristic of various diseases float in the air, in many localities, at least. Hence rotting material, teeming with bacterial life, may or may not contain disease-producing germs, according to whether

the latter have settled upon it by accident or not. Even if these disease-producing species were as numerous in the dust as the common bacteria of putrefaction, which we do not know, they would be at a disadvantage as far as their increase is concerned. For experience has shown that the germs of most diseases require a special soil for their growth, and cannot live, like the agents of putrefaction, upon any organic refuse. In some cases, indeed, these microscopic parasites are so fastidious in their demands that they cannot grow at all outside of the animal body which they are adapted to invade. Hence if a decomposing fluid does contain them, they form at least a minority of the inhabitants, being crowded out by the more energetically growing forms. In the microscopic world there occurs as bitter a struggle for existence as is ever witnessed between the most highly organized beings. The species best adapted to the soil crowds out all its competitors.

Though the putrefaction bacteria, or, as Dumas calls them, the agents of corruption, are not identical with disease-producing germs, they are yet not harmless by themselves. Putrid fluids cause grave sickness when introduced into the blood of animals in *any quantity*. But this is not a bacterial disease proper; it is an instance of poisoning by certain substances produced by the life-agency of the bacteria while decomposing their soil. The latter themselves do not increase in the blood of the animal; they are killed in their struggle with the living animal cells. The putrefaction bacteria need not be further present in the putrid solution to produce the poisonous effect on animals. They may be killed by boiling if only the poisonous substances there formed remain.

In order to prove the bacterial origin of a disease, two requirements are necessary: First, we must detect the characteristic bacteria in every case of that disease; secondly, we must reproduce a disease in other individuals by means of the isolated bacteria of that disease. Both these demonstrations may be very difficult. Some species of bacteria are so small and so transparent that they can not be easily, if at all, seen in the midst of animal tissues. This difficulty may be lessened by the use of staining agents, which color the bacteria differently from the animal cells. But it often requires long and tedious trials to find the right dye. The obstacles in the way of the second part of the proposition mentioned are no less appalling. Having found a suspected parasite in the blood or flesh of a patient, we can not accuse the parasite with certainty of being the cause of the dis-

ease, unless we can separate it entirely from the fluids and cells of the diseased body without depriving it of its virulence. In some cases it is not easy, if possible, to cultivate the parasite outside of the body; in other instances it can be readily accomplished. Of course, all such attempts require scrupulous care to prevent contamination from other germs, that might accidentally be introduced into the same soil. If we can now reproduce the original disease in other animals by infection with these isolated bacteria, the chain of evidence is complete beyond cavil and doubt. But this last step may not be the least difficult, as many diseases of mankind can not be transferred to animals, or only to some few species.

If we apply these rigid requirements, there are not many diseases of man whose bacterial origin is beyond doubt. As the most unequivocal instance, we can mention splenic fever, or anthrax, a disease of domestic animals, which sometimes attacks man, and is then known as malignant pustule. The existence of a parasite in this affection in the form of minute rods and its power of reproducing the disease are among the best-established facts in medicine. It is also known that these rods form seeds or spores, as they are termed, in their interior, after the death of the patient, which germinate again in proper soil. These spores are the most durable and resisting objects known in animated nature. If kept in the state of spores they possess an absolute immortality; no temperature short of prolonged boiling can destroy them, while they can resist the action of most poisons, even corrosive acids, to a scarcely credible extent.

Another disease, of vastly greater importance to man, has lately been added to the list of scourges of unquestionable bacterial origin. I refer to tuberculosis, or consumption. It is true, this claim is based upon the work of but one investigator—Robert Koch. But whoever reads his original description must admit that no dart of criticism can assail his impenetrable position. Here also a rod-shaped bacillus, extremely minute and delicate, has been found the inevitable companion of the disease. With marvelous patience Koch has succeeded in getting the parasite to grow in pure blood, and freeing it from all associated matter. It must have been a rare emotion that filled the soul of that indefatigable man, when he beheld for the first time, in its isolated state, the fell destroyer of over one-eighth of all mankind! None of the animals experimented on could withstand the concentrated virulence of the isolated parasite. This bacillus likewise produces spores of a persistent nature, which every consumptive patient spits broadcast into the world.

Relapsing fever is another disease of definitely proved origin. If we mention, furthermore, abscesses, the dependence of which on bacteria has lately been established, we have about exhausted the list of human afflictions about the cause of which there is no longer any doubt. Some diseases peculiar to lower animals belong also to this category. The classical researches of Pasteur have assigned the silkworm disease and chicken cholera to the same rank. Several forms of septicæmia and pyæmia have also been studied satisfactorily in animals. Indeed, the analogy between these and the kindred forms of blood-poisoning in man is so close that there can be no reasonable doubt as to the similarity of cause. This assumption, next door to certainty, applies equally to the fevers of childbirth. The experimental demonstration of the parasitic nature of leprosy, erysipelas, and diphtheria is not yet complete, though nearly so. Malarial fever also is claimed to belong to the category of known bacterial diseases, but the proofs do not seem as irreproachable to others as they do to their authors.

The entire class of contagious diseases of man can be suspected on just grounds of being of bacterial origin. All analogies, and not a few separate observations are in favor of this view, while against it no valid argument can be adduced; but it must be admitted that the absolute proof is as yet wanting. Many diseases also, not known to be contagious, like pneumonia, rheumatism and Bright's disease, have been found associated with parasites, the *role* of which is yet uncertain. It is not sophistry to look forward to an application of the germ theory to all such diseases, if only for *the* reason that we know absolutely no other assignable cause, while the changes found in them resemble those known to be due to parasites. In the expectation of all who are not blinded by prejudice, the field is a vast one, which the germ theory is to cover some day, though progress can only continue if we accept nothing as proved until it is proved.

There can be little doubt that in many, perhaps in most instances, the disease-producing germs enter the body with the air we breathe. At any rate, the organism presents no other gate so accessible to germs as the lungs. Moreover, it has been shown that an air artificially impregnated with living germs can infect animals through the lungs. How far drinking water can be accused of causing sickness as the vehicle of parasites cannot be stated with certainty. There is, as yet, very little evidence to the point, and what there is is ambiguous. Thus, exposed from all quarters to the attacks of these merciless in-

vaders, it seems almost strange that we can resist their attacks to the extent that we do. In fact, one of the arguments used against the germ theory—a weak one, it is true—is, that, while it explains why some fall victims to the germs, it does not explain why all others do not share their fate. If all of us are threatened alike by the invisible enemies in the air we breathe, how is it that so many escape? If we expose a hundred flasks of meat-broth to the same atmosphere, they will all become tainted alike and in the same time. But the animal body is not a dead soil in which bacteria can vegetate without disturbance. Though our blood and juices are the most perfect food the parasites require, though the animal temperature gives them the best conditions of life, they must still struggle for their existence with the cells of the animal body. We do not know yet in what way our tissues defend themselves, but that they do resist, and often successfully, is an inevitable conclusion. We can show this resistance experimentally in some cases. The ordinary putrefaction bacteria can thrive excellently in dead blood, but if injected into the living blood-vessels they speedily perish. Disease-producing germs, however, are better adapted to the conditions they meet with in the body they invade, and hence they can the longer battle with their host, even though they succumb in the end.

The resistance or want of resistance which the body opposes to its invaders is medically referred to as the predisposition to the disease. What the real conditions of this predisposition are, we do not know. Experience has simply shown that different individuals have not an equal power to cope with the parasites. Here, as throughout all nature, the battle ends with the survival of the fittest. The invaders, if they gain a foothold at all, soon secure an advantage by reason of their terrific rate of increase. In some instances they carry on the war by producing poisonous substances, in others they rob the animal cells of food and oxygen. If the organism can withstand these assaults, can keep up its nutrition during the long siege, can ultimately destroy its assailants, it wins the battle. Fortunately for us, victory for once means victory forever, at least in many cases. Most contagious diseases attack an individual but once in his lifetime. The nature of this lucky immunity is unknown. The popular notion, that the disease has taken an alleged "poison" out of the body, has just as little substantial basis as the contrary assumption that the parasites have left in the body a substance destructive to themselves. It is not likely, indeed, that an explanation will ever be given on a purely

chemical basis, but in what way the cells have been altered so as to baffle their assailants in a second attempt at invasion is as yet a matter of speculation. Unfortunately for us, there are other diseases of probable bacterial origin, which do not protect against, but directly invite, future attacks.

A question now much agitated is, whether each kind of disease-germs amounts to a distinct and separate species, or whether the parasite of one disease can be so changed as to produce other affections as well. When investigations on bacteria were first begun, it was taken for granted that all bacterial forms, yeast-cells and mold-fungus, were but different stages of one and the same plant. This view has long since been recognized as false. But even yet some botanists claim that all bacteria are but one species, appearing under different forms according to their surroundings, and that these forms are mutually convertible. The question is a difficult one to answer, since bacteria of widely differing powers may resemble each other in form. Hence, if a species cultivated in a flask be contaminated by other germs, accidentally introduced, which is very likely to happen, the gravest errors may arise. But the more our methods gain in precision, and the more positive our experience becomes, the more do we drift toward the view that each variety of bacteria represents a species as distinct and characteristic as the separate species among the higher animals. From a medical stand-point this view, indeed, is the only acceptable one.

A disease remains the same in essence, no matter whom it attacks, or what its severity be in the individual case. Each contagious disease breeds only its own kind, and no other. When we experiment with an isolated disease-producing germ, it causes always one and the same affection, if it takes hold at all.

But evidence is beginning to accumulate that, though we can not change one species into another, we can modify the power and activity, in short, the virulence, of parasites. Pasteur has shown that when the bacteria of chicken cholera are kept in an open vessel, exposed to the air for many months, their power to struggle with the animal cells is gradually enfeebled. Taken at any stage during their decline of virulence, and placed in a fresh soil in which they can grow, be it in the body of an animal or outside, they multiply as before. But the new breed has only the modified virulence of its parents, and transmits the same to its progeny. Though the form of the parasite has been unaltered, its physiological activity has been

modified; it produces no longer the fatal form of chicken cholera, but only a light attack, from which the animal recovers. By further enfeeblement of the parasite, the disease it gives to its host can be reduced in severity to almost any extent. These mild attacks, however, *protect the animal against repetition.* By passing through the modified disease, the chicken obtains immunity from the fatal form. In the words of Pasteur, the parasite can be transformed into a "vaccine virus" by cultivation under conditions which enfeeble its power. The splendid view is thus opened to us of vaccinating, some day, against all diseases—in which one attack grants immunity against another. Pasteur has succeeded in the same way in another disease of much greater importance, namely, splenic fever. The parasite of this affection has also been modified by him, by special modes of cultivation, so as to produce a mild attack, protecting against the graver form of the disease. Pasteur's own accounts of his results, in vaccinating, against anthrax, the stock on French farms, are dazzling. But a repetition of his experiments in other countries, by his own assistants, has been less conclusive. In Hungary the immunity obtained by vaccination was not absolute, while the protective vaccination itself destroyed some fourteen per cent. of the herds.

Yet, though much of the enthusiasm generated by Pasteur's researches may proceed further than the facts warrant, he has at least opened a new path which promises to lead to results of the highest importance to mankind.

The ideal treatment of any parasitic disease would be to administer drugs which have a specific destructive influence upon the parasites, but spare their host, i. e., the cells of the animal body. But no substance of such virtue is known to us. All so-called antiseptics, i. e., chemicals arresting bacterial life, injure the body as much if not more than the bacteria. For the latter of all living beings are characterized by their resistance to poison. Some attempts, indeed, have been made to cure bacterial (if not all) diseases by the internal use of carbolic acid, but they display such innocent *naivete* as not to merit serious consideration. More promising than this search after a new philosopher's stone is the hope of arresting bacterial invasion of the human body, by rendering the conditions unsuitable for the development of the germs, and thus affording the organism a better chance to struggle with them. Let me illustrate this by an instance described by Pasteur. The chicken is almost proof against splenic fever. This protection Pasteur attributes to the high normal

temperature of that animal, viz, 42° Cent. At that degree of warmth the anthrax bacillus can yet develop, but it is enfeebled. The cells of the bird's body, thriving best at their own temperature, can hence overcome the enfeebled invader. Reduction of the animal's temperature, however, by means of cold baths, makes it succumb to the disease, though recovery will occur if the normal temperature be restored in due time. In the treatment of human diseases, we have not yet realized any practice of that nature, but research in that direction is steadily continuing.

The most direct outcome of the germ theory, as far as immediate benefits are concerned, is our ability to act more intelligently in limiting the spread of contagious diseases. Knowing the nature of the poison emanated by such patients, and studying the mode of its distribution through nature, we can prevent it from reaching others, and thus spare them the personal struggle with the parasite. In no instance has the benefit derived from a knowledge of the germ theory been more brilliantly exemplified than in the principles of antiseptic surgery inaugurated by Lister. This benefactor of mankind recognized that *the* great disturbing influence in the healing of wounds is the admission of germs. It had been well known, prior to his day, that wounds heal kindly if undisturbed, and that the fever and other dangers to life are an accidental, *not* an inevitable, consequence of wounds. But Lister was the first to point out that these accidents were due to the entrance of germs into the wound, and that this dangerous complication could be prevented. By excluding the parasites from the wound, the surgeon spares his patient the unnecessary and risky struggle, giving the wound the chance to heal in the most perfect manner. Only he who has compared the uncertainty of the surgery prior to the antiseptic period, and the misery it was incompetent to prevent, with the ideal results of the modern surgeon, can appreciate what the world owes to Mr. Lister. The amount of suffering avoided and the number of lives annually saved by antiseptic surgery constitute the first practical gain derived from the application of the germ theory in medicine.

FORM AND NATURE OF ACCIDENTS OCCASIONED BY THE ERUPTION OF WISDOM-TEETH.

BY DR. E. MAGITOT, PARIS.

Considered in a general manner, the accidents occasioned by the eruption of a wisdom-tooth are very numerous.

A methodical division of the phenomena is not an easy thing, and very often an accident of a certain nature at the first appearance modifies itself to pass into and through other successive forms.

However, as a classification is necessary to the description, we have adopted the following:

1. Inflammatory accidents, subdivided into accidents of the mucous membrane, and accidents of the bony structures.

2. Nervous accidents, pain in the nerves, troubles in organs of some special sense, and reflex phenomena.

3. Organic accidents, which include the follicular cysts of the wisdom-teeth, the odontomata, and new formations.

First, Inflammatory accidents.

Mucous accidents.—The mucous accidents connected with the eruption of wisdom-teeth are extremely frequent. They commence with a simple irritation of the gums and finish with an abscess, ulceration or gangrene. Sometimes, however, the local accident is isolated, sometimes there is a complication of disturbances of the neighboring parts more or less intense.

In all cases, this mucous form of accidents is, of many, the most common, for in the statistics given by Dr. David of seventy-five accidents due to this eruption, it represents a proportion of seventy observations, which gives in the sum of various accidents the proportion of about 93 per cent.

In the most simple cases, the mucous membrane of the region of the wisdom-teeth is merely lifted, moderately swollen and tender. The accident, without passing unperceived, causes only a slight pain, and the tooth shortly overcoming this obstacle, appears above the gum in the midst of some shreds having about the aspect of proud flesh. The pressure of these shreds, which remain for some time on the chewing surface of the tooth, causes invariably the formation of certain ponches which become filled with foreign matter and debris of food, and thus become true centres of the production of caries.

It is by this process that they cause so premature injuries to wisdom-

teeth to such a degree that some inattentive observers have asserted that wisdom-teeth often erupt in a carious condition.

In a more pronounced stage of the inflammation of the gums, the portions of mucous membrane lying upon the tooth are the seat of a true abscess, at the centre of which the tooth itself is found, which remains thus imprisoned without communication with the exterior. It is to this form of accident that Chassaignac has given the name, *encystment* of the wisdom-tooth, to distinguish it from the preceding form, which he calls encasing.

This distinction, which seems a little too fine, is in other respects wholly artificial; for the first form ordinarily blends with the other, when, after the spontaneous or intentional opening of the abscess, the enclosed tooth finds itself in communication with the outside.

The phlegmonous form consists of a true follicular abscess, and in this case the local accident most commonly extends itself to the neighboring parts. Sometimes it is an inflammation of the gums, which extends forward along the border of the gums and sometimes even to the median line. Sometimes it is an inflammation of a gland, whose particular character is that of extreme persistency as long as the cause remains unknown. Toirac mentions a very remarkable observation concerning it by Dr. Fiard. From the glands, the inflammatory process extends itself to the soft palate and to the pharynx, giving place to an equally obstinate inflammation.

Be it as it may, this form of accidents is altogether peculiar for the inferior and superior wisdom-teeth.

For the inferior jaw, the simple eruption of a tooth, otherwise normal as to volume and direction, may be its cause, while in the upper jaw it produces only that condition when the wisdom tooth is directed abnormally either outside toward the cheek or backwards toward the anterior part of the palate. It is moreover generally to this form that the troubles confine themselves, as we have remarked. To the phlegmonous form which we were indicating, and now and then also to a simple inflammation of the gums, the ulcerous state often succeeds. One sees then on a level with the torn shreds of the mucous membrane, or as a consequence of the opening of the follicular abscess, some irregular ulcerations with grayish bottom, covered with shreds of epithelium, which give the aspect described under the name of ulcero-croupous stomatitis.

The seat of these ulcerations is the region of the border of the gum around it, quite often it is the mucous membrane of the cheek;

more rarely the seat of the ulceration is on the tongue, when the wisdom-tooth has a direction inwards. In every case, the ulcerous variety is that which we have indicated elsewhere in speaking of inflammation of the gums properly, as representing for a certain number of authors, and for ourselves, the true nature of ulcero-croupous stomatitis as occurring among the soldiers and in general among young subjects at the age of the eruption of the wisdom-teeth.

The mucous accidents of wisdom-teeth comprise, then, as one sees, three varieties: the simple inflammation of the gums, the phlegmonous inflammation of the gums, and the ulcerous variety.

But this is not all. In these three varieties, more especially in the two last, there are produced ordinarily some complications in the neighboring parts. The most frequent is the inflammation of the submaxillary gland. It appears almost infallibly when the local inflammatory phenomena take a notable intensity of a certain duration. This adenitis, particularly persistent in the ulcero-croupous form which has been described as occurring among young soldiers as the consequence of the pressure of the collar, or other special cause, appears in our opinion as belonging to the series of accidents of the wisdom-teeth. This glandular inflammation, considered as a complication of an accident of the mucous membrane, will have nevertheless for its exclusive seat the sub-maxillary glands for the inferior jaw and the parotidal glands for the superior. The cervical glands themselves become swollen only when the morbid phenomena have invaded the bony tissues of the jaws. From glandular swelling to inflammation properly there is only one step, and this new complication is very frequent. Here the inflammation appears under the different forms which we have designated as simple oedema, circumscribed abscess, and diffused abscess, according to the extent of the original injury. We may say that in an accident of the mucous membrane the oedematious inflammation is the most common complication.

The phlegmonous form belongs to the cases of severe inflammation of the mucous membrane, or to those particular cases in which an inferior wisdom-tooth finds itself enclosed in the soft parts of the cheek, where it determines ulcerations, indurations and fungous growths, in the midst of which the tooth may be found encased.—*Le Progress Dentaire.*

L. B. Brooks.

NOTCHED TEETH.

In a paper read at the Société de Chirurgie of Paris, M. Magitot, says the "British Medical Journal," lately called attention to the notchings and erosions of the teeth in inherited syphilis, and on the relations of this disease to rickets. He thinks that the notch is not characteristic, and states that it is never found in some races frequently affected by syphilis, such as the Japanese and Peruvians. According to Magitot, not only inherited syphilis, but also all other serious troubles of nutrition, may cause diminution in the number and size of the teeth, or delay in the period of their eruption, but never erosion. Most frequently, the latter is caused by certain nervous affections of early childhood, such as infantile convulsions, especially when accompanied by general debility.—*N. Y. Medical Journal.*

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ORIGINAL COMMUNICATIONS.

ROLE OF BACTERIA IN FERMENTATION AND PUTREFACTION.

BY C. S. BOYNTON, M. D., BRANDON, VT.

[Read before the American Dental Convention, at Saratoga, N. Y., August, 1883.]

We often refer with pride to the fact that we live in an age of progress, and point with admiration to the rapid strides which science has made in the last half-century.

But if we pause and consider how long many discoveries, of priceless value to humanity, have been hidden under the bushel of professional prejudice, or lies openly revealed before any steps are taken towards their practical application, humiliation takes the place of pride; and we find the same spirit that disputed the truths of Galileo and Hunter still alive.

For more than two thousand years the attraction of light bodies by amber was the sum of human knowledge regarding electricity, and for more than two thousand years fermentation was effected without any knowledge of its cause.

"Our remote ancestors had learned by experience that 'Wine maketh glad the heart of man.' Noah, we are informed, planted a vineyard, drank of the wine and experienced the consequences."

It is a matter of history that one discovery grows out of or follows another, and cannot appear without its proper antecedent.

Thus the microscope had to be invented and brought to a considerable degree of perfection before the phenomena of fermentation could be understood.

In the year 1680, Leeuwenhock found yeast to be a mass of floating globules, and for a period of one hundred and fifty years this was all that was known regarding it.

In 1837, Schwann clearly established the connection between putrefaction and organic life; but thirty years had to elapse before Lister extended to wounds the results of the researches of Schwann on dead flesh and animal infusions.

Prior to Lister, the possibility of some such extension had occurred to other minds.

Observing men had noticed the action of germs which produced putrefaction of meat, and had asked themselves the question, Might not these same germs act with fatal effect in the wards of a hospital?

The physicians of this period, guided entirely by empirical knowledge, were in this respect "wiser than they knew."

They had discovered the evils incident to dirt, and, by keeping dirt away from them, had saved many lives; but why dirt was fatal, few of them knew. Lister came forward with this scientific truth: Dirt was fatal, not as dirt, but because it contained living germs which Schwann was the first to prove are the cause of putrefaction, thus by one step changing the art of surgery into a science.

In 1864, in a paper read before the British Medical Association, Mr. Spencer Wells pointed out that the then recent experiments of Pasteur had "all a very important bearing upon the development of purulent infection and the whole class of diseases most fatal in hospitals and over-crowded places."

Two years prior to this, Dr. William Budd had drawn up a series of "Suggestions towards a Scheme for the Investigation of Epidemic and Epizootic Diseases." "What we most want to know," says Budd, "in regard to this whole group of diseases is, *where and how the specific poisons which cause them breed and multiply.*"

The word poisons here employed was a concession on Budd's part to his weaker brethren; for he, without a shade of doubt, considered the poison to be a real living seed.

From this time on, the investigation has progressed, carried on in the old Baconian lines of observation and experiment—spurred on by the investigations of Burdon, Sanderson, Koch, and others.

It has grown and multiplied till the germ theory has forced itself

upon the notice of every scientist, whether he would accept the doctrine or not. It has solved many a problem which hitherto has been looked upon as past finding out, or blindly accepted as a punishment sent by the Almighty for the sins of the people.

But the progress of these investigations has been greatly hindered by the popular fallacy in the minds of many of confounding scientific knowledge with practical uselessness.

The scientific thinker is met on all sides by the oft-repeated question, "Will it pay?" or, "What is the use?"

It is natural for man to wish to investigate whatever gives evidence of thought. The field of thought is the home of a thinking being, the home of man; and whatever manifests thought, without evil associations, is never to be regarded as useless. He may not have so far analyzed his intellectual forces as to know why he is impelled to this or that investigation. He is unable to give a satisfactory answer to those who demand the use. But he knows there is a use, as he knows that food strengthens the body, although he may be in happy ignorance of such an organ as the stomach, and have no notion of the peculiar office of carbon and nitrogen compounds. He cannot tell how food acts, but he goes on eating, for his appetite demands it; and, in satisfying its cravings, the good of the body is cared for.

So this intellectual appetite has led men to dig among ruins, to wipe the dust from the ancient inscription, to gather as a pearl every monument of human thought, to scan every form of matter as it exists in nature—the crystal and the flower—the animal, from the largest to the animalcule—those now living, and those sleeping in their beds of stone. This intellectual appetite has led men to labor, though unable to frame arguments in favor of what they knew to be right, and it has always led them in the right direction. With us, physical activity is considered by many the chief end of man. In the general apprehension, the study-lamp of the student shines on an idle dreamer—a drone in the great hive.

Says one of the profoundest philosophers that England ever produced, "It would not be difficult, by an unbroken chain of historic facts, to demonstrate that the most important discoveries in science and improvements in the mechanic arts had their origin, not in the cabinets of statesmen or in the practical insight of men of business, but in the visions of recluse genius."

But popular opinion is fast finding out that "the unobtrusive thinker is not a cipher at the left hand of society," and nowhere is this truth

more apparent than in the results that are being reached by the study of these organisms which we are now considering. The agriculturist, the silk-grower, the vine-dresser, the brewer, the surgeon, the physician, the dentist, the architect, have each in turn sought counsel of the scientist and his microscope, and in every instance have been obliged to acknowledge that there is a *money value* in the relations which the thinker holds to the community around him.

The teachings of our school-days were that organic matter, deprived of the vitality to which it owed its existence, was unstable in its chemical constitution, and the tendency was to go back to the inorganic state through the operations of simple chemical affinities. If this explanation was not clear to our minds, and the fact was referred to that the western hunter who supplied himself with food for the winter by exposing his fresh-killed buffalo meat to the action of the sun and air that swept over those arid plains, did so in direct contradiction to these teachings, to clinch the seeming loose joints in this argument, we were informed that the rule or law was that "the soft parts of animal bodies were especially liable to change after death"; while the exception in the case of the hunter was simply on account of the dryness and great purity of the air. This much was true, but why this air was pure our teachers knew not, and up to within a few years we all have been content with this explanation. We say that it is one of the laws of nature for butchers' meats and vegetables to putrefy and decompose, for milk to turn sour, and the juice of fruits to ferment, and the fruits themselves to decay. And with scrupulous care and large outlays of money, we have sought out many inventions to avoid these results. A pile of green herbage heats and rots, and wood exposed to moisture gradually loses strength and disappears to help form vegetable mould.

A large part of what we call the physical phenomena of this world is largely made up of these various changes; but they are going on so constantly, silently and abundantly about us, that we rarely notice or stop to consider the causes which produce them. As these changes have gone on in the past, we are led to conclude that they will continue. We just as much expect fresh meat will spoil in summer as we do that one season will follow another in regular succession. The wine-maker has no doubt about the fermentation of the juice of the grape, the brewer of his wort, or the baker of his dough, though neither the one nor the other may stop to consider the philosophy of the phenomena with which they are respectively confronted. They hav-

ing ascertained by experiment the governing conditions, proceed with the confident assurance of "what has been, will be."

When we say that "dead organic matter has in itself no such tendency to spontaneous change, that, subject, as in nature generally, to all the activities of *pure air* and *pure water*, and to these alone, whatever the temperature, dead fish and flesh will not become ill-scented or putrid, that milk and blood will not change from the condition they have when drawn from the living animal, that a heap of green or wet grass will not heat and rot, that moist wood will remain as durable as granite, and that the substances of our own bodies after life has departed, are as incorruptible as gold."

These words, to you who hear them for the first time, seem foolish, and upon the face of them absurd; yet, this is the teaching of science, and is the unavoidable conclusion from many instructive experiments.

To-day, any one who will visit the laboratory of Von Recklinghausen, will see blood there, four and five weeks out of the body, preserved in little porcelain cups under glass shades. Not only can you see the amœba-like movements of the white corpuscles, but you will have abundant proof of the growth and development of these corpuscles. You may be shown a frog's heart still pulsating that has been removed from the body for more than a week. You gaze on these results in wonder, and ask whence this mystery—why has not putrefaction set in and obeyed the same laws that it does elsewhere? The professor will tell you there is nothing strange in what you see; the whole mystery consists in keeping the blood free from dirt. He acknowledges frequent failures, but these he attributes to particles of dirt escaping his precautions.

"Progress in science is based on the well-grounded idea that every effect has an adequate cause, and that these causes, in the material world, at least, are subject to undeviating law.

If a body moves, we search for the force which produced the motion, and usually not in vain. If change occurs, a competent agent is at once supposed to be instrumental in its accomplishment. Students of nature are not content with passing anything as mysterious which can be brought within the domain of knowledge, nor with accepting as a fact anything which does not fall *within* the range of *natural causes*."

Posessed of this spirit and provided with the necessary instruments and means, the subject before us could not escape investigation by the quickened intellects of recent times.

"The result is, after much conflict of opinion and difference of interpretation, the established fact that *the natural changes taking place in non-living organic matter are all due to the vital activity of living things.*"

Some of the usual results of life forces may be accomplished in the chemist's laboratory, but the processes and conditions there and in nature are entirely different. Losing sight of this fact oftentimes leads us to false results.

"Life manufactures, and life in turn pulls to pieces and destroys."

Though we may be unable to tell what this life is, or to what its particular powers are due, we can know and study its effects, and these are as pronounced and unique in the natural destruction as they are in the natural upbuilding of organic matter. In this work of destruction, the low microscopic organisms are by no means alone. Every living creature is continually destroying itself, reducing, through its physiological and normal processes, the solid parts to liquids and gases, from the organic to the inorganic. This is the waste which all plants and animals suffer as long as life continues. After death waste goes on in a different way, through the physiological and normal activities of other living beings, and the more noticeably because there is no repair. Among these destroyers are many kinds of animals and plants. All animals are included in the list, and the digestion of food with them is always a work of destruction.

But it is to the *fungi* that we must look for the principal agents of the plant kind, which act as pure destroyers of organic matter. These degraded plants live solely on the accumulated and organized products of other plants and animals, assimilating a portion for the architecture of their own bodily structure, and exhaling another very considerable part as waste, in one shape or another, but ultimately as carbonic acid and water—two prominent ingredients in the original nutrition of green-leaved plants.

An old log in the woods, having no tendency to decay, resisting much better than iron the slow corrosion of the oxygen of the air, tumbles to powder under the digestive power of insects, toadstools, and bacteria, each working differently, but accomplishing nearly the same results. Among the destructive alterations of organic matter, those known as fermentation and putrefaction are peculiarly the effects of certain species of low plants. Because they are so minute, they are not commonly known to be present; hence, the popular idea that the processes are spontaneous, due to the nature of the material in which they occur.

If yeast is not added to the saccharine fluid, but is separated from it by a filter of porous earthen ware, the saccharine fluid will not ferment, although the filter allows the fluid part of the yeast to pass through into the solution of sugar. If the saccharine fluid is boiled so as to destroy the efficiency of any yeast it may accidentally contain, and then allowed to come in contact only with such air as has been passed through cotton-wood, it will never ferment. But if it is exposed freely to the air, it is almost sure to ferment sooner or later, and the probability of its so doing is greatly increased if there is yeast anywhere in the vicinity.

These experiments prove: (1), That there is something in the yeast that provokes fermentation; (2), That this something may have its efficiency destroyed by a high temperature; (3), That this something consists of particles which may be separated from the fluid which contains them by a fine filter; (4), That these particles may be contained in the air, and that they may be strained off from the air by causing it to pass through cotton-wood. Let us examine this yeast in its quantity before and after fermentation. The brewer introduces, say ten pounds of yeast; he collects forty or it may be fifty pounds. The yeast has therefore augmented from four to five fold during the fermentation. Shall we conclude that this additional yeast has been spontaneously generated by the wort? Are we not rather reminded of that seed which fell on good ground? This notion of organic growth is more than a surmise, for beneath the powers of the microscope we can see it budding and sprouting before our eyes. The augmentation of the yeast is thus proved to arise from the growth of a minute plant called *torula*. Spontaneous generation is therefore out of the question. The brewer deliberately sows the yeast plant, which grows and multiplies in the wort as its proper soil.

But says one, who has followed us thus far, the fermentation of the grape juice is spontaneous—no seed sown there, what can you say about spontaneous generation here?

Let us look at the facts. The wine-maker does not, like the brewer and distiller, deliberately introduce either yeast, or any equivalent of yeast, into his vat; he does not consciously sow in them any plant or the germ of any plant; indeed, he has been hitherto in ignorance whether plants or germs of any kind have had anything to do with his operations. Still, when the fermented grape juice is examined, the living *torula* concerned in alcholic fermentation never fails to make its appearance. How is this? If no living germ has been introduced

into the wine-vat, whence comes the life so invariably developed there? You may be disposed to reply, with Turpin and others, "that in virtue of its own inherent powers, the grape juice, when brought into contact with the vivifying atmospheric oxygen, runs spontaneously and of its own accord into the low form of life." We have not the slightest objection to this explanation, provided proper evidence can be adduced to support it. But the evidence snaps asunder under the strain of scientific criticism, and we are obliged to look for some other answer to this question. What, then, is the decision of experiment in reference to the life in the wine-vat? Take a quantity of the clear filtered "must" of the grape, boil so as to destroy such germs as it may have contracted from the air or otherwise. In contact with germless air, the uncontaminated must never ferments. All the materials for spontaneous generation are there, but so long as there is no seed sown, there is no life developed, and no signs of that fermentation which is concomitant of life. Nor is it necessary that we should use a boiled liquid. Nature has so sealed the juice of the grape by its own skin, that it is safe against contamination from without.

Pasteur has extracted from the interior of the grape its pure juice, and proved that, in contact with germless air, it never acquires the power to ferment itself, nor to produce fermentation in other liquids. It is not, therefore, in the interior of the grape that the origin of the life observed in the vat is to be sought. What, then, is its true origin? This is Pasteur's answer, which his well-proved accuracy renders worthy of all confidence:

At the time of the vintage, microscopic particles can be observed adherent both to the outer surface of the grape and to the twigs which support it. Brush these particles into a capsule of pure water, it is rendered turbid by the dust. These minute particles, when examined by the microscope, present the appearance of organized cells. If, instead of receiving them in water, we brush them into the pure inert juice of the grape, and examine this juice forty-eight hours after, we shall find our familiar *torula* budding and sprouting, the growth of the plant being accompanied by all the other signs of active fermentation. What is the inference to be drawn from this experiment? Obviously, that the particles adherent to the external surface of the grape include the germs of that life which, after they have been sown in the juice, appear in such profusion. The ferment of the grape clings like a parasite to its surface, and the art of the wine-maker, from time immemorial, has consisted in bringing—and, it may be added, ignorantly

bringing—two things thus closely associated by nature into actual contact with each other. For thousands of years, what has been consciously done by the brewer has been done unconsciously by the winegrower. The one has sown his leaven just as much as the other. Nor is it necessary to impregnate the beer wort with yeast to provoke fermentation. Abandoned to the contact of our common air, it sooner or later ferments ; but, the chances are that the product of that fermentation, instead of being agreeable, would be disgusting to the taste. By a rare accident, we might get the true alcoholic fermentation, but the odds against obtaining it would be enormous. Pure air, acting on a lifeless liquid, will never provoke fermentation ; but our ordinary air is the vehicle of numberless germs which act as ferments, when they fall in appropriate infusions, some producing acidity, others putrefaction or alkalinity. The germs of our yeast-plant are also in the air, but so sparingly distributed that an exposed infusion, like beer-wort, is almost sure to be taken possession of by foreign organisms, and the life of the brewer is a constant warfare against these objectionable ferments.

You can understand from this how easy it is to fall into error in studying the action of any one of these ferments. It is only by the experimenter availing himself of every means of checking his conclusions, that he can walk without tripping through this land of pitfalls. Let us fix our attention more particularly upon the growth and action of the true yeast-plant under different conditions. Let it be sown in a fermentable liquid, which is supplied with plenty of pure air. The plant will flourish in the aërated infusion and produce large quantities of carbonic acid gas. The oxygen thus consumed by the plant is the free oxygen of the air, which we suppose to be abundantly supplied to the liquid. The action, so far, is similar to the respiration of animals, which inspire oxygen and expire carbonic acid. If we examine the liquid when the vigor of the plant has reached its maximum, we hardly find in it a trace of alcohol. And could every individual yeast-cell seize, without any impediment, free oxygen from the surrounding liquid, it is certain that it would cease to act as a ferment altogether. This experiment leads us to ask, what, then, are the conditions under which the yeast-plant must be placed so that it may display its characteristic quality? Consider the beer in its barrel with a single small aperture open to the air, through which it cannot imbibe oxygen but continually pours forth carbonic acid gas. Whence comes the volume of oxygen necessary to the production of this latter gas?

The small quantity of atmospheric air dissolved in the wort, and overlying it, would be totally incompetent to supply the necessary oxygen. The only way left for the plant to provide for its respiration the needed oxygen, is to wrench it from surrounding substances in which the oxygen exists—not free, but in a state of combination. This it does by decomposing the sugar in the solution in which it grows, producing heat, and breathing forth carbonic acid gas, and one of the liquid products of this decomposition is our familiar alcohol. The act of fermentation, then, is the result of the effort of the little plant to maintain its respiration by means of combined oxygen, when its supply of free oxygen is cut off; or, as Pasteur defines it, "*life without air.*" But here we must take heed lest we fall into a possible error.

"It is not all yeast-cells that can thus live without air and provoke fermentation. They must be young cells which have caught their vegetative vigor from contact with free oxygen. Under these new conditions its life, *as a plant*, will be by no means so vigorous as when it had a supply of free oxygen; but its action, *as a ferment*, will be indefinitely greater."

Liebig, in his studies on fermentation, assumed that yeast acted in virtue of its *organic* character.

Ludersdorf concluded that it acted in virtue of its *organized* character, and proceeded to show it by the following experiment: He destroyed the cells of yeast by rubbing them on a ground glass plate. Here the life was destroyed, but the chemical constituents remained the same; but its power to act as a ferment totally disappeared.

Does the yeast-plant stand alone in its power of provoking alcoholic fermentation? In answering this question, we have occasion to marvel at the sagacity of observation among the ancients to which we owe so vast a debt. Not only did they discover the alcoholic ferments of yeast, but they had to exercise a wise selection in picking it out from others, and giving it special prominence. Place an old boot in a moist place, or expose common paste or a pot of jam to the air; it soon becomes coated with a blue-green mould, which is nothing else than the fructification of the little plant, *pencillium glaucum*. Do not imagine that this mould has sprung spontaneously from boot, or paste, or jam; its germs, which are abundant in the air, have been sown, and have germinated in as legal and legitimate a way as thistle-seed wafted by the wind to a proper soil. Let these same minute spores of *pencillium* be sown in a fermentable liquid, which has been previ-

ously boiled so as to kill all other spores or seeds which it may contain, let pure air have access to the mixture, the *pencillium* will grow rapidly, striking down deep into the liquid its long filaments, and fructifying at its surface. If we test this infusion at various stages of the plant's growth, you will never find in it a trace of alcohol. But forcibly submerge the little plant, push it down deep into the liquid, where the quantity of free oxygen that can reach it is insufficient for its needs, it immediately begins to act as a ferment, supplying itself with oxygen by the decomposition of the sugar, and producing alcohol as one of the results of the decomposition. Many other low microscopic plants act in the same way.

The transformation of wine into vinegar is a phenomenon long known and utilized. From a chemical point of view, this transformation is due to the oxidation of the alcohol. The agent of this oxidation is a micro-organism called *mycoderma aceti*. It belongs to the group of the *micro-bacteria*, and its development presents some interesting peculiarities, which we give in the language of M. Duclaux: "These little beings reproduce themselves with such rapidity that by placing an imperceptible germ upon the surface of a liquid contained in a vat having a surface of one square meter, in round numbers, nearly 1,600 square inches, we may see it covered in from twenty-four to forty-eight hours with a uniform velvety veil. This veil is well known to every one as the *mother of vinegar*, and its rapid production is worthy of note. If we estimate that there are three thousand cells in a square millimeter, which is below the truth, this will give for the vat three thousand milliards of cells produced in a very short time."

The *mycoderma aceti* is not always the same. Usually it forms upon the surface of a liquid a soft-looking veil, smooth at first, then wrinkled, which is with difficulty submerged and moistened. If we plunge a glass rod into the liquid, it pierces this veil, and, on withdrawing it, a portion remains attached to the rod, and the opening made immediately disappears, being occupied by the veil which seems never to have room enough in which to extend itself. We frequently find another form of veil, dryer, firmer, sometimes showing prismatic colors. This veil does not wrinkle, but is covered with crossed undulations, having sharp edges, which recall the surface of a honey-comb. Sown upon the surface of various liquids, it reproduces itself identically, and it is difficult not to consider it a different form of the preceding. There is still another species producing well-developed veils,

with scarcely any acetifying power, and reproducing itself with this character. These forms are difficult to distinguish the one from the other, because of their minuteness. We may say, however, that the second is smaller than the first, and the third more attenuated than either of the others.

We have said that our air is full of germs differing from the alcoholic leaven, and sometimes seriously interfering with it. So we find it with the acetic fermentation. The liquid in which this ferment is cultivated should be a little acid, for, in this microscopic garden we find plenty of weeds ready to rise up and choke out the flowers. The weed in this case is an entirely different organism—a species of saccharomycite, known as *the mycoderma vini*, which has an action quite different from the M. aceti. It is a consumer of the alcohol, transforming it into water and carbonic acid. It also consumes the acetic acid. By making the liquid acid in which acetic fermentation is wished to take place, we render the conditions of growth unfavorable to *mycoderma vini.*

Please to notice again that observation has guided men right in the selection of this ferment, and the proper method to combat its enemies, long before science could aid them in the least. Observation has taught us that we must sow *M. aceti*, or we should see the *M. vini* develop in its place, as the germs of the latter are more widely diffused in the air.

Saccharine fluids, left to themselves, are susceptible of divers fermentations, which may occur separately or simultaneously. Those which have been best studied are three: The lactic, the butyric, and the viscous fermentations.

Lactic Fermentation : If we expose milk to the action of the air, it will after a time turn putrid or sour, separating into clot and serum. Place a drop of such milk under your microscope, and watch it closely. You see the minute butter globules animated by that curious quivering motion, called the Brownian movement. Do not tarry over this too long, for it is another motion that we have now to seek. Here and there you observe a greater disturbance than ordinary among the globules. Keep your eye on the place of tumult and you will see emerging from it a long eel-like organism, tossing the globules aside, and wriggling its way more or less rapidly across the field of the microscope. Part of the change wrought in the milk is due to this organism, which, from its motions, receives the name, *vibrio.* This bacterium, according to Pasteur, develops in sweet liquids, in which

it causes the formation of acetic acid, and in milk the coagulation of the casein. In curdled milk, you find other organisms, small, motionless, and usually linked together like beads on a string. Under the influence of this bacterium (ferment lactique of Pasteur), glucose, and the substances susceptible of furnishing it (such as mannite, malic acid, etc.), are transformed into lactic acid. The chemist will tell us that this is nothing but a molecular change, lactic acid having the same composition as glucose. Taken in mass the lactic ferment resembles beer yeast—its consistence a little more viscous, and its color a little more grey; but, under the microscope, the aspect is quite different. An interesting point concerning this fermentation is the action of acids upon the bacteria which produce it.

As soon as the medium becomes acid, even by the lactic acid produced, the transformation is arrested. It resumes its course if chalk or carbonate of soda is added to the liquid. The most suitable temperature is 95° Far. (35° Cent.) But milk may become putrid without becoming sour.

Examine putrid milk microscopically, and you find it swarming with shorter organisms, sometimes associated with the vibrios, sometimes alone, and often manifesting a wonderful activity of motion. Keep these organisms and their germs out of your milk, and it will never putrefy. Heat kills the bacteria, cold numbs them. The housekeeper, though ignorant of these little organisms, heats the milk, or places it in contact with ice to extend its period of sweetness and postpone the evil day. We often see this fermentation occur in beef juice or in sour starch water; it must play a part in the formation of sour krout, and intervenes very certainly, and perhaps more than the alcoholic fermentation, in the preparation of bread. It very easily invades beer, because of its slight acidity. This fermentation, of which we know so little, merits to be better studied.

The Butyric Fermentation is in fact always preceded by a lactic transformation, and it is by an ulterior modification that the lactic acid produces the butyric acid. The organism which produces it is a bacterium very nearly allied to *bacillis subtilis.* This fermentation resembles putrefaction in a great many particulars; some authors include it under the same head.

Viscous Fermentation: Wines often change so they contain a mucilaginous substance and mannite. This viscous matter has the same composition as gum or dextrine ($C_6H_{10}O_5$), at the same time disengaging carbonic acid gas. In the fermenting liquid we find an

organism which is not yet sufficiently studied. These are little chaplets of small spherical bodies, of which the size varies sensibly, according to the kind of wine attacked by the malady. We have united together the lactic, butyric, and viscous ferments, because all three manifest themselves in the same liquids, and because they have for effect the transformation of glucose.

Nitrification and Putrefaction : In the fermentations which we have just passed rapidly in review, we have thus far been able to study at least the chemical action of the different organisms. We are now about to find ourselves in presence of phenomena far more complex. We will have to consider a great number of these vegetables at work, without it being possible to assign to each its rôle, or to say what is its function. The agent of the nitric fermentation has not as yet been seen, and it is only by analogy that we class this nitrification with the true fermentation. It is only because of the obscurity which still exists in regard to a great number of peculiarities of these two phenomena that we have united them in the same study. From the point of view of the circulation upon the surface of our globe of the elements essential to the constitution of organisms, they play an analogous *role*, although opposite the one to the other.

Consider nitrogen in plants. This element, of which the atmosphere is the reservoir, does not enter directly into combination, as does oxygen with the other elements which, with it, are to constitute the immediate principles of the tissues. The chemical properties of nitrogen may be characterized in a few words: Great resistance to entering into combination when it is free, and great facility, on the contrary, in passing from one combination to another when once it has associated itself with other elements.

Whence comes the ammonia which is found in the sea, in the clouds which come to us from equatorial regions, and in the dust of the air? The only known source is the fermentation of organic matters out of reach of the oxygen of the air. It is to this sort of fermentation that we owe the formation of peat, and the masses of combustible minerals which have formed during nearly all the geological periods. When we expose an organic liquid to the air, we see this sort of fermentation develop itself; but only in the inferior part of the liquid, the oxygen which is dissolved near the surface being arrested in the superficial zone, where a very different fermentation occurs. The one at the surface is essentially oxidizing; the material is almost completely burnt, forming water and carbonic acid, while at

the inferior part, on the contrary, a reduction is produced so energetic that hydrogen is disengaged. The metallic sulphites are there transformed into sulphates, and even crystals of sulphur are sometimes found in the organisms of thermal sulphur waters, where they constitute flocculi and play a great rôle in the elimination of sulphur and the disengagement of sulphuretted hydrogen in these waters. Vegetables do not absorb nitrogen under the form of ammonia, but under the form of nitric acid.

How is this transformation of ammonia into nitric acid effected? Repeated observation has confirmed the fact that in the phenomena of destructive putrefaction, nitric acid, far from being produced is, on the other hand, reduced to the state of nitrous acid; and in the putrefactions essentially oxidizing, produced by *pencillium glaucum* and others of this species, there is no formation of nitric acid. Nitrification is a special phenomenon which takes place in every soil sufficiently loose to permit a free circulation of air, and of which the agent is a micro-organism. This organism has not yet been perceived, it is true; and it is evident that it would be difficult to seek and observe, because of its peculiar situation. But the action of chloroform upon nitrification tends to prove that the agent of this process is truly an oxidized ferment. This anæsthetic suspends nitrification, and seems even to kill the ferment. This nitrification, or rather the ferment which causes it, can only take place during summer temperature, and the observing farmer, as he stirs his soil to admit the needful oxygen freely, just as we stir the fire in winter to admit it, learns to perceive when his soil is in a lively "rising" state of fermentation almost as well as his wife perceives when her dough is working aright, although hitherto science had no explanation to offer of what the practical farmer was sure that he observed. We may distinguish in the agents of putrefaction, or more generally of fermentation, two groups of micro-organisms—one oxidizing, the other reducing. The first are observed upon the surface of liquids undergoing putrefaction. We notice a great number of forms, *bacterium termo*, *monas crepusculum sirillum*, etc. We ought also to include *mycoderma aceti* which, like the other, vegetates on the surface of liquids. The second, on the contrary, in the interior of liquids or of fermentable bodies—they are analogous to the butyric and lactic ferments. These low organisms, which one might be disposed to regard as the beginnings of life, were we not warned that the microscope, precious and perfect as it is, has not the power to show us the real beginnings of life (for evidently there is

a great unknown world of minuteness still beyond its highest powers), are by no means purely useless or purely mischievous in the economy of nature. They are only noxious when out of their proper place. They exercise a useful and valuable function as the burners and consumers of dead matter, animal and vegetable, reducing such matter, with a rapidity otherwise unattainable, to innocent carbonic acid and water. Futhermore, they are not all alike, and it is only restricted classes of them that are really dangerous to man. One difference in their habits is worthy of special reference here. Air, or, rather, the oxygen of the air, which is absolutely necessary to the support of the bacteria of putrefaction, is absolutely deadly to the vibrios which provoke the butyric acid fermentation. This can be illustrated by any one having a microscope. A drop of the liquid containing these small organisms is placed on a slide, and on the top place a very thin cover glass; for, to see them, it is necessary that the object glass of the microscope should come very close to the organisms. Round the edge of the circular plate of glass, the liquid is in contact with the air, and incessantly absorbs it, including the oxygen. Here, if the drop be charged with *bacteria termo*, we have a zone of very lively ones, greedy of oxygen, and appropriating it to their use, while through this living zone the vivifying gas cannot penetrate to the center of the film; and here we find in the middle the bacteria dead and dying. If a bubble of air chance to be inclosed in the film, round it the bacteria turn and wabble, until its oxygen has been absorbed, after which all their motions cease. The reverse of this occurs in the vibrios of butyric acid. In their case, it is the peripheral organisms that are first killed, the central ones remaining vigorous, while ringed by a zone of dead. It was while observing these differences of deportment that the thought of life without air and its bearings on the theory of fermentation flashed on the mind of Pasteur.

To some minds, the question of putrefaction being the results of these micro-organisms, is by no means clear; they may concede that they have an important part to play in some of the fermentations named; but we oftentimes find them asking, How do we know that these organisms are not the mere accompaniers of this condition?

In the year 1837, Schwann, of Berlin, announced the important result that when a decoction of meat is effectually screened from the ordinary air, and supplied solely with calcined air, putrefaction never sets in. He therefore affirmed putrefaction to be caused by something in the air, which could be destroyed by a sufficiently high tem-

perature. And to-day the fermentation of fruit juices has been brought under control in every household in the land by a knowledge, consciously or unconsciously, of this deduction of Schwann's; they have learned that a heat of 130° Far. is sufficient to destroy the germs in wine, cider, etc., and that, if they are sealed up while every part is at or over that temperature, without the possibility of a single one of the swarming germs being sealed inside, without having been subjected to that heat, the article so secured will remain unchanged as long as the sealing remains entire.

In verifying these experiments in putrefaction, Spalanzani melted the neck of the little flask together during the cooking. The result was that the material enclosed in the flask remained for all time without putrefaction. Then came the assertion that the materials enclosed in the flask of Spalanzani remained fresh, not because there was no bacteria in them, but rather because there was no oxygen present; for it is certain that, by cooking, the air is expelled and the entrance of new oxygen is rendered impossible by the melting of the neck of the flask. In order to refute this objection, Dr. Schwann modified this experiment by blowing air into the flask through a red-hot tube previous to melting its neck. By this process, all the living germs were destroyed.

Dusch, in 1854, seeking a more convenient method, plugged the neck of the flask with cleansed cotton, by which the air was filtered from germs as it entered the flask.

In 1863, Pasteur became interested in these experiments, and reasoning from the fact that the germs contained in the air, following gravitation, settle down in open vessels, after boiling his infusions, bent down the neck of the flask horse-shoe shape, without melting it. The results of these methods were always the same; the materials enclosed never fell into putrefaction. From these experiments, often repeated with the same results, it has been concluded that putrefaction does not take place if no bacteria are present; and, on the other hand, that the multiplication of bacteria ceases as soon as the substances capable of producing putrefaction are destroyed. Therefore, bacteria are not the chance companions but rather the cause of putrefaction, and Cohn, in the light of the foregoing experiments, defines putrefaction to be "*a chemical process excited by bacteria.*" Death does not, as is generally supposed, cause putrefaction, but rather it is caused by the life of these invisible organisms.

The whole arrangement of nature is based on this, that the body in

which life has become extinguished succumbs to dissolution in order that its material may become serviceable to new life. The amount of material which can be moulded into living beings is limited; the same particles of material must ever be converted from dead into living bodies in an eternal circle. If the wandering of the soul be a myth, the wandering of matter is a scientific fact.

What, then, would be the result if there were no bacteria? The material embodied in animals and plants of one generation would, after their decease, remain bound as the chemical combinations in the rocks; new life could not develop, because there would be lack of body material. Since bacteria cause the dead body to come to the earth in rapid putrefaction, they alone cause the springing forth of new life, and thus make the continuance of living creatures possible. The wonderful fact that putrefaction is a work performed by bacteria does not stand alone; we have seen that there is an entire series of chemical changes which are produced by these and similar microscopic forms. The great bulk of the plant world derives its nourishment from inorganic matter; the plant, taking the crude materials as they are furnished in the salts of the soil, elaborates them in its cells, and forms from them its cellulose, its starch, its chlorophyll and its diastaste.

On the other hand, animal life depends in as great a degree upon materials which have been already elaborated by vegetable chemism. It depends mainly upon the plants, starch, and gluten, in one shape or other. Either taking them direct, or, as in the case of carnivorous animals, simply taking the results of their assimilation by others, how long could this double drain on nature continue with no return? The farmers, many of them rather late in life, have learned that they cannot demand food from the soil without rendering some return. In their ignorance, our ancestors for years defrauded the earth which gave them bread, and we are just learning that we must in some shape or other, by the use of fertilizers, pay back the debt we owe to mother earth, or lack a harvest.

What are these fertilizers? Nothing more than materials which have, by the aid of bacteria, completed the circle of nutrition—materials which have been taken from the earth in the first place to form plant tissue, this in its turn has been appropriated by the animal economy, and these very animals yield themselves up at last, in the shape of phosphates, etc., to the soil which takes back its own. Thus we complete the circle; here we find the life-work of bacteria placed

by nature everywhere. We can well call them omnipresent—standing on the picket-line between live and dead matter, sentinels of nature, ever watchful to cast back into life's domain the materials for its ceaseless, ever changing tide.

Thus hastily have we reviewed this subject—not as an investigator, but, rather, as a gleaner from the teeming fields—a gatherer of stray straws that have been left by those bold spirits who are engaged in gathering the great mass of facts, that now show such an abundant harvest for science, which, in being left, has furnished us an index by which we could refer to their work, hoping that by the glimpses caught from the gleanings, you may be induced to become workers in this or kindred fields, thus adding by your labors to the general stock of scientific knowledge.

"EASTERN TRUTH-SEEKER."

An anonymous, who styles himself "An Eastern Truth-seeker," publishes an article in the Ohio State Journal, full of sneaking side kicks at somebody who is never mentioned. The "Truth-seeker" shows occasionally a glimpse of light. The passage, "A man who has the courage of his convictions is always an object of admiration," is very good, and if "Truth-seeker" means what he says, we can do nothing better than advise him to carry out the axiom. The gentlemen referred to by "Eastern Truth-seeker," who by accident are connected with an eastern periodical, are just such men, who have the courage of their convictions, and deserve certainly the reward mentioned. The "Truth-seeker" informs us that "facts are facts." He has gained certainly a great deal of truth, if he has come to that conclusion; but the arrangement of facts in logical order is no natural sequel whatever; it takes brains to do that. The facts about the planets were known many years before Kepler, who, by the way, did not "divest the *Copernican* system of the universe of its absurdities." "Truth-seeker" seems to have made a confusion of the Copernican and the Ptolomean systems. The Copernican system did not contain "absurdities," only inaccuracies. Every young student of a high school knows that the Copernican system of the universe refuted the absurdities of the Ptolomean system, and Kepler was only the calculating astronomer, who applied figures to the general theories of Copernicus. Copernicus and Ptolomy ought not to be confounded by "Eastern Truth-seeker."

How one can speak of flask experiments as being as near the natural condition of the mouth as possible, or, as being worth anything, requires an "Eastern Truth-seeker" to understand. *Flask experiments are worthless;* let us keep that in mind. There is not the faintest resemblance between the tooth in the flask and the tooth in the jaws, even the tooth is not the same. We do not dispute the superiority of Dr. Miller's work; he has done a very great thing indeed, and his experiments, aided by the microscope, and the chemical authorities of Germany, have more than sufficiently established certain facts. These facts we all agree upon; we differ only in their explanations. But Dr. Miller has not disproved facts that were established before him. "Eastern Truth-seeker" claims he can prove by his microscope—that famous microscope!!—that the softened dentine near the sound portion of the tooth is not dead, if that tooth has a live pulp; that is at least the plain statement that we can make uot of ten lines of words. Well, let him do it, and show something! The dental world will be thankful and no damage done. "Truth-seeker" is very modest in his desire for common sense. He wants only about "four and one-half grains." Why, for mercy's sake, we can let him have that without difficulty, and we will give him a printed instruction how to use it, together with his microscope. We would still have enough left to supply seven thousand more to come at the rate demanded.

COMMON SENSE.

"Every time one breathes, over five hundred millions of air-cells are inflated, and five hundred millions of networks of capillary vessels send their blood-disk along, purified, vitalized, dancing for joy."

"He who will look steadfastly out into the world, will perceive himself surveyed by a great eye returning his stare."

"Gravitation is the Holy Ghost of the material world."

EDITORIAL.

IS A "DEAD TOOTH" DEAD?

From an article in the July number of the *Ohio State Journal*, by Dr. Frank Brewer, of San Francisco, we make the following selection :

"Now, then, let us turn our attention to a *dead* tooth, and ascertain the truth or denial of the claim that its corpse is but a *peg* stuck in the jaw. We first, then, present and answer the following question : Do the canaliculi or dentine tubular tissue cease their vitality and life simultaneously with the death of the *nerve when devitalized?* We reply, no ! provided the same has not been paralyzed with arsenic or other escharotics. Indeed, so excessive have we found the sensitiveness in certain cases, or those where the nerve organ had become calcified through abrasion, that an obtunder was demanded in their reduction. In one case at Santa Barbara, and which at the time was recorded in the *Missouri Dental Journal*, the sensation was so severe that the contact of the drill made the patient fairly howl, and required several applications of chloride of zinc to reduce it. This sensation was observed not only throughout the zone of calcification of the nerve locality, but embraced all the intermediate area, defining the original nerve canal and cementum. The patient being at the time an invalid, from nervous anomaly, this phenomenon was attributed thereto. But of late we find ourselves mistaken, for two months since an additional case, similar in character—nerve calcified—came within our hands, whose constitutional diathesis proved the very opposite of the previous case. This one, also, was found excessively sensitive, and required several applications of a cauterant to control. Numerous cases of teeth with nerves calcified, and manifesting more or less sensibility, have we operated upon. In cases of *spontaneous* devitalization, uninfluenced by any original accident of mechanical injury, this phenomenon is again verified, and the sensation will be observed located at a position contiguous to the cemental structure. Again, it may be recognized in cases of gaseous encroachment within. A tooth laboring under gas encroachment, and with no abscess or sinus, as soon as the crown is opened, relief seems almost instantaneous, especially during the latter condition, and as well as at others, *thermal* influences are quite readily observed, and the *passage* of the *finger nail* upon the cervix of either labial or buccal surface of the

tooth, the same is noticeable. We have retained the same vitality by withdrawal of a nerve following its *anæsethetization*, by which no *excitation followed* at any point along its course, especially necessary at the apices. Hence, if this all be true, from *whence* cometh the nourishment *sustaining* this neural *vitality?* We can only reply, from the *periosteum*, aided principally and protected by the peculiar conformation of the *vascular* tissue of the *cementum* and *Nasmyth's* membrane."

DR. BOYNTON'S PAPER.

In this number of the JOURNAL our readers will find the paper read by Dr. Boynton at the American Dental Convention at Saratoga last August. The object of the paper is to give the profession a *resume* of the subject of Fermentation and Putrefaction as it is now looked upon by those scientists who have made this subject a study from the point of view of the germ theory.

The Doctor, in his introductory remarks, disclaimed any attempt at originality, acting only as a "middle man in science," drawing freely from the literature of the subject, aiming only to give a clear and comprehensive view of the subject as it is now understood.

At first, it may seem to have little connection with dentistry; but, to those who feel that the germ theory of dental caries is true, it is full of interest. We talk learnedly of fermentation and putrefaction often as though the terms were interchangeable, but we find one precedes the other; and here comes in the question of treatment. If fermentation is the first step, what measures can we take to stop these ferments? Checking the fermentation checks further inroads which lead on to caries, and with this we are brought face to face with the question of antiseptics and antiseptic treatment for diseases of the oral cavity.

For our own part, we had rather the Dr. would have given us a few hints on these subjects from his own note-book rather than to have drawn so largely on Tyndall, Pasteur, Magin, Cohnn, and, in fact, all that have written on the subject. He has given us facts as they are now believed to exist; this is all right, but to some of us in daily practice it would have seemed a little more practical to have told us what was to be done by way of treatment.

We should not be so pronounced in our opinion if we had not been favored for years with the doctor's acquaintance, and know that for fifteen years, at least, he has been a firm advocate of the germ theory

and has been on the lookout for facts, and from what we know of his note-book we can only wish he had given us a little more of the practical side. We hope, on reflection, he will conclude to give the readers of the Journal a peep into that note-book, especially the part relating to antiseptics.

As it is, the paper has a value in enlarging our ideas of the extent to which we are indebted to micro-organisms for the production of a large share of the physical phenomena of this world.

THE NEW ENGLAND DENTAL SOCIETY.

The New England Dental Society will meet at Providence, R. I., on the 4th and 5th of October. Arrangements have been made for half-fare trip tickets on the Boston and Providence railroad, and also on the New York, Providence and Boston, and a reduction from regular fares on the Worcester and Providence road. The Narragansett Hotel—headquarters—offer reduced rates. Prof. Garretson will be present and deliver an address and give a clinic. A most excellent meeting is assured, and every dentist in New England should be present.

CONNECTICUT VALLEY DENTAL SOCIETY.

The annual meeting of this Society is to be held at the Haynes House, Springfield, Mass., on Wednesday and Thursday, November 7th and 8th.

PEARSON'S DENTISTS' APPOINTMENT BOOK.

We have to thank the publishers for one of "*Pearson's Dentists' Appointment Books* for the vest pocket." This is a *model* of an appointment book, and is published by J. L. Brewster, Jr., of the Kansas City Dental Depot, publisher of the Missouri Dental Journal. The author, Dr. R. I. Pearson, is the managing editor of the same Journal.

TO NEW SUBSCRIBERS.

The subscription price of the New England Journal of Dentistry for 1884 will be the same as in the past, viz: $2.00 per year. *Subscriptions received now will not expire till December, 1884.*

Dr. Karl Burger, of Bonn, claims to have discovered the bacterium of whooping cough.

The July number of the Correspondenz-Blatt für Zahnärzte (Dental Exchange), has just reached us. It is a very voluminous quarterly of about one hundred pages. Dr. Kronthal, of Posen, reports a case of destructive periodontitis of all the teeth in the upper jaw occurring in a woman twenty-nine years old.

Dr. Telschow, a very prominent practical dentist of Germany, who is a specialist there in continuous gum work, gives his experience. The paper of Dr. D. D. Smith, of Philadelphia, read at the meeting of the Mass. Dental Society, is reprinted. Dr. Sozinskey, in an article about the lancet and its uses, re-tells the good story that a man of the name of Rodgers, at the court of Charles I., died in his ninety-sixth year in consequence of *teething*. Four teeth were already erupted, and several more were about to erupt, which caused a violent inflammation of the gums, and from that his death. Poor baby! Dr. Truman W. Brophy's (of Chicago) article on caries and necrosis of the jaw, the article of Dr. J. N. Crouse about the methods and materials for preserving the teeth, and of Dr. W. A. Stevens, of Chicago, from the Ohio State Journal, appear in translation. The firm, Ash & Son, of London, controls the monthly, as the "Cosmos" is controlled by S. S. White, etc.

A sad-looking display of "patents revoked" is given at the end of the Journal. The superiority of the American patent law is plainly seen. The German patent law is nothing but a rather mean contrivance to squeeze out of poor inventors more and more tax every year. It starts on the wrong supposition that a patent which does not pay a yearly tax, increased every year, should not be held. This is a very thin sophism. Many of the American patents which finally prove a great benefit to the public and inventor have been of value only after many years of work. So the bicycle patent, which did not pay very much for the first few years. According to the German law, the owner of the patent would have had to pay every year taxes of from fifty to a hundred dollars, or have his patent revoked. This clause of the German patent law makes German patents rather worthless and appears to be on one line with the love of the German political economists for the income tax.

One who uses Robinson's Fibrous Foil for lining vulcanized rubber plates, states that good results are obtained by the following method: After vulcanizing at "320" for forty-five or fifty minutes, run the temperature up to 345 or 350 and hold it there for a few moments. This seems to consolidate the metal lining and forms a better surface.

THE DENTAL MUTUAL AID ASSOCIATION.

We are glad to record the fact that an Association, bearing the above name, is being organized. It is in the hands, at present, of some live men in the State of Missouri, where, by virtue of its "charter," the home office will be located, probably either at St. Louis or Kansas City.

Its purpose is like that of similar organizations chartered by traveling men, railroad men, physicians, etc. We see no reason why the dental profession may not successfully carry out a scheme of this character to the entire satisfaction of all concerned. By the proper operation of such an organization, the families of men who have given the best part of their lives that others may be benefited would thus be saved the embarrassment and humiliation of being placed before the world as absolute paupers. Such cases are not uncommon. It is proposed to carefully guard the Association by such restrictions as may seem necessary. It will be officered by some of the best men in the profession and the membership will be confined to State and local dental societies. Age, health and morals will also be considered. Its operations are expected to extend over the whole country, each State having a board of advisory officers. We hope to be able to give full particulars in our next number.

DEATH OF PROF. T. L. BUCKINGHAM.

Thomas L. Buckingham, M. D., D. D. S., died, at Philadelphia, Sept. 4th, 1883, of softening of the brain, in the sixty-seventh year of his age.

Dr. Buckingham was so well known by the dental profession that an obituary notice is apparently unnecessary. A *son* feels the need of no such notice when a *father* dies; and Dr. Buckingham was one of the fathers of the dental "Israel."

THE LIFE OF MAN.

One of our subscribers sends us the following, clipped from some newspaper:

"Man, born of woman, is of few days and no teeth. And, indeed, it would be money in his pocket sometimes if he had less of either. As for his days, he wasteth one-third of them, and as for his teeth, he has convulsions when he cuts them, and as the last one comes through, lo! the dentist is twisting the first one out, and the last end of that man's jaw is worse than the first, being full of porcelain and a roof-plate built to hold blackberry seeds."

Cremation in Japan is becoming very general; about 9,000 bodies are disposed of in this way yearly.

SOCIETIES.

THE TWENTY-NINTH ANNUAL MEETING OF THE AMERICAN DENTAL CONVENTION, HELD AT THE TOWN HALL, SARATOGA SPRINGS, N. Y., AUGUST 14, 15, AND 16, 1883.

The morning session of August 14 was mostly given to organization. Rev. Joseph Cary, D. D., was present, and addressed the meeting at its opening.

CONGRATULATORY ADDRESS OF DR. J. G. AMBLER.

I congratulate you, Mr. President and Gentlemen, on the number convening, and in doing so I beg leave to express the thanks of the committee to our worthy president and secretary for their solicitude in making the preparations for this meeting. I trust that the preparations thus far will meet with your approval, and it is a pleasure and duty of the chairman of the executive committee to do his duty until the closing of the convention, which I trust may be instructive and interesting. It has been my luck to be a co-worker since the commencement. I have seen the convention in its infancy and I have seen it in mature age, have seen it under a cloud, have seen it when its members were few and when they were many; through all the steps it has been my pleasure and luck to have mingled with you. I have found that this organization is independent of all other organizations —additional, but by no means oppositional. The course we have marked out is thoroughly democratic. Other organizations exist by representatives of local societies; we open our doors wide for all. All with clean spirits, to whom no objection can be made, are invited to participate in our discussions, and give us the benefit of their ideas, thus multiplying the information, making each one the recipient of the art of all. I trust that the convention will be replete with representations and practices of modes of operation, and that we will have many, detailing minutely their efforts in what we call incidents of office practice, which will take a prominent part in our proceedings.

Dr. Clark gives his opening address. (See next number.)

The business affairs of the convention are arranged and the meeting adjourned for the afternoon.

Afternoon Session, August 14, 1883.

The first subject is the paper of Dr. Boynton, printed in this number.

Prof. CHARLES MAYR, Springfield, Mass.: The paper of Dr. Boynton presents many very interesting points. Something very new to me was the communication of experiments tending to prove that saltpetre may be due to the action of certain organisms in the decaying inorganic matter. These organisms seem to reach further than we ever thought before; there seem to be many ways that lead to Rome. We all know that alcohol can be made in the most diverse manners; it can be made in our laboratories without any yeast at all, from the pure elements C, H and O, without the intervention of any organized substance, and the alcohol prepared in this way is identical with the alcohol prepared from fermentation. Not only alcohol, but even more complex substances, like organic acid, etc., are made in this way in our laboratories; but if we make them in our laboratories in a certain way, this does not prove that in the body they are made in the same way. Nitric acid, as most of you know, can also be made artificially without any difficulty, by letting an electric spark pass through a mixture of oxygen and nitrogen in the presence of some alkali; the nitric acid combines with the alkali and forms nitrates, but the presence of an alkali is not necessary for the formation of the nitric acid; it will form without it, only if the acid formed is not absorbed, the action of the electric spark soon ceases and only a limited amount can be produced. It would be of little interest should I detail the exact way of making alcohol without fermentation; a pound of this alcohol may practically cost $500, made in the laboratory from H, C, O, but as far as science is concerned, dollars and cents do not play any part whatever; the only question is, that it can be done; many people confound the money part with the scientific point. All are well aware of the way in which acetic acid may be generated without a trace of mycoderma aceti; dilute pure alcohol is dropped on platinum black, and with evolution of heat a part of it is transformed into aldehyde, another part into acetic acid, that is, the acid of vinegar. If one wishes a still better resemblance to the common "old-fashioned" cider vinegar, one can take a little mud from the street and throw it into the solution, together with a few rotten apples, the flavor and appearance can be imitated to identity; popular ignorance is still in favor of the cider mud.

Dr. F. Y. CLARK: At the Springfield meeting it was stated by Drs. Miller and Barrett that teeth filled out of the mouth will remain for ages free from decay; I have made experiments and find that I cannot produce any chemical action of bacteria without moisture, and I

think that it applies not only to the tooth substance but to all animal tissues. It is absolutely necessary that there must be moisture; fill a tooth, exclude all moisture, free it from all its mesh-work, and dry it, and I doubt very much whether there be ever any bacterial action under the filling. I remember some time ago, when I began practicing, there were mounds in Florida; I would dig, and every now and then I would come across teeth; every other particle of the body was gone. Of these mounds the Seminoles knew nothing, they were very old. All you could find by going down six to eight feet was a clump of teeth, and where you would find one you would find another, showing that persons were buried there. After six or eight months I tried to ascertain how the men were buried. I worked in one mound very carefully, and finally came to the roots of teeth. I removed the soil around these roots; I came to one root and then another, until I came to the roots of fourteen teeth upward; I kept on removing the soil, until I found the fourteen teeth antagonizing with the fourteen in the superior maxilla; that was a very important discovery, showing that the person was buried erect, and that has caused a great deal of discussion among scientists in regard to the mound-builders and those teeth in the mounds. Where there was any moisture, no remains could be found; where the soil was perfectly free from moisture, those teeth could be found in any state of preservation. One set I retained for a long time. Since the experiments of Dr. Miller, told at Springfield, I have filled teeth out of the mouth, leaving them moist, and I find that there is a micro-organic action, even out of the mouth; the deportment of natural teeth out of the mouth and in the mouth are two very different things; in the mouth we have all the natural elements for producing the reaction; we have every facility for the production of germs.

In regard to the paper of Dr. Böynton, I can fully endorse what he said in regard to fermentation. In regard to putrefaction, I can say there is no putrefaction without bacterium termo; wherever putrefaction is going on, this organism is found, along with other organisms, but bacterium termo is the one which has most to do with putrefaction. And wherever putrefaction commences, in all examinations that I ever made, I could find no organism at work but bacterium termo. It will be noticed in all putrefying fluids, and when putrefaction ceases, they can no more be found.

Dr. Rich: Dr. Clark has said that teeth will not decay when dry; one thing occurred to me while he was speaking. Supposing a filling

was made of gutta-percha, very tight, and left in the mouth for six months or a year, you then apply the rubber dam before taking out the filling, you dry the tooth all around and allow no access of moisture, you then remove the filling and fill it again as perfectly as possible, would we have any decay?

Dr. CLARK: There is always a fight going on between the inner and outer forces. Right there is what we call protoplasm; I call it bioplasm. It is a part of the tooth substance, it is the mesh-work of the tooth; distinct fibers have never positively been discovered; it contains a certain amount of moisture; it is a clear transparent liquid oozing out if you cut your finger; if you watch the cut carefully you may see it, and I contend that there is in every tooth, in the dentine and enamel, this bioplasm. Tomes claims to have seen nerve fibers in it, McGill has denied it. I stated that we could not prove the existence. There is the bioplasm that affords a large amount of moisture. When the tooth has been attacked and the cavity has extended some distance, there is an effort of the bioplasm to resist, shown by ossification shutting out the organisms, but very often they are too strong and get the start, and the tooth has to succumb; but if the bioplasm of the tooth or the mesh-work should be sufficiently organized to fight the little enemy successfully, I do not think that decay would be very apt to occur. In the case of Dr. Rich, I would say, if the cavity was hermetically sealed, as Dr. Rich supposed, that it would be perfectly safe unless some abnormal conditions should occur. This question might require a great deal of fine argument.

Dr. WHITE: Concerning the very question of Dr. Rich, I would state that in a paper read before the State Society, a year ago, I took that ground. In the last three or four years, I probably filled all large cavities in this manner. I first filled in oxyphosphates or oxychlorides, and at the expiration of a week or ten days, sometimes as long as two years, I capped the soft material with something harder, gold or amalgam. I think I can say that it is a most successful process. I have always applied the rubber dam before removing the soft material, and filling with the hard material. I have never found gutta-percha to fill hermetically a cavity; I believe that it is so unreliable in this direction that I never employed it except temporarily.

Dr. RICH: I have put this question for the very reason that I have been practicing this method for the last six years and have succeeded wherever I expected.

Dr. White: I think that Dr. Clark has a tooth in his mouth that was filled that way ten years ago; it may be twelve years ago.

Dr. F. Y. Clark: The tooth is there now.

Dr. Lovejoy: I would like to ask Dr. Rich with what material he usually fills the cavities in the cases mentioned.

Dr. Rich: I would say that I more particularly fill the cavities in this way where there are chances of permanent fillings producing bad results, and where there is nearness to the pulp or exposure; I do not mean to say that I do it in all cases; you could not do that.

The next subject is the paper of Dr. C. T. Stockwell, of Springfield. (See next number.)

[To be continued.]

SELECTIONS.

ARTHUR S. UNDERWOOD'S REPLY TO DR. FRANK ABBOT.

To the Editor of the "Journal of the British Dental Association."

Dear Sir: In your last issue you quote some utterances of Dr. Frank Abbot upon dental caries, which more or less demand an explanation from those who differ from him with regard to the pathology of the disease. The criticisms of Dr. Abbot upon the germ theory will possibly be more valuable when the critic has had time and opportunity to study the nature of micro-organisms and find out what they really are. At present, as he says, he fails to find them in carious cavities. I can only conclude that he does not use the word germ in the same sense as Pasteur and Lister, and under these circumstances he can possess only a very confused notion of the septic theory of caries. The only statement in the first page of your quotation which might not have been culled from any of the current handbooks for the last ten years, is that micrococci prosper in alkaline, but never in acid fluids, which statement is clearly incorrect. Leaving this page, the next original statement is that it is easy to demonstrate the fact that the irritation of the animal matter in the enamel (presumably the tissue observed by Heitzmann and Bödecker between the prisms) passes beyond the "point at which absolute destruction of the tissue has taken place." Now seeing that the very existence of this tissue is so difficult of demonstration that many

careful observers are not quite convinced of its existence, and that it is absolutely avascular, it would require rather delicate microscopy to decide whether or not this minute thread was in a state of irritation; I cannot but suppose that words are here used to conceal their sense, or rather their nonsense. Whatever the "glue-giving basis substance" may be, it is described as "melting down," "bringing to view the medullary or embryonal elements of the enamel" (*sic*).

Dr. Abbot further assures us that enlarged canaliculi may be the scene of a healthy change, that the acids are removed, the inflammation subsides and the lime-salts are redeposited, leaving the structure to all appearances as healthy as before. How he arrived at this conclusion I cannot imagine, seeing that it would obviously be impossible to tell that the restored canal was ever diseased, unless a diseased canal could be watched under the microscope and seen to become restored. It would appear, therefore, that this observation rests upon Dr. Abbot's imagination alone, and yet he makes it the ground for assuming that it is unreasonable to pretend that the enlarged canaliculi are filled with organisms, in the face of the fact repeatedly vouched for by many observers in England and on the Continent, including Professor Koch, Dr. Miller (Berlin), Mr. Tomes, Mr. Mills, myself, and others, that such organisms are invariably found in such canals. Certainly if Dr. Abbot feels bound to discuss these matters, in order not to disappoint his friends and make strangers smile, he should either study the matter or avoid "original" statements, and content himself with the safer, if less glorious, process of abstracting or collating.

Dr. Abbott ends his paper by proposing four questions:

1. "Why is it that the teeth of all persons do not decay the same?" This has no reference to the germ theory because, as we took pains to point out when first broaching our theory, the initial stages of decay depend upon congenital or acquired weakness of the enamel, and facilities for the lodgment of the decay-producing agencies.

2. "Why are lower front teeth less liable to decay, although the greatest amount of organism may be found upon them?" This question arises apparently from a confusion in the mind of the questioner between leptothrix and micrococci. The latter are, so far as can be ascertained, equally distributed all over the mouth, except that they remain in greatest abundance between adjacent teeth, or in spaces where food can lodge.

3. "Why is it that teeth, with the greatest amount of lime-salts

and the smallest amount of organic matter (upon which organisms subsist), do not decay sooner and more rapidly than the reverse?" Granting, for the moment, that this is so, I should say, because the organisms, finding more pabulum in the more organic teeth, destroy them more readily, since they have more power of proliferation in such tissues—but unless supported by evidence the statement is a pure assumption.

4. "Why is it that a pulp canal which has held a dead and putrefying pulp for many years, upon being opened, is found as solid and free from decay as it was before the pulp died?" Firstly, *putrefying pulps* are generally destroyed and extracted, or cleaned and rendered pure, and teeth containing them are not left for years unopened (the result of which treatment would probaby be an alveolar abscess); but if Dr. Abbot simply means dead pulps sealed up, the organisms in such pulps do not live for more than a very brief space of time, as contact with the air and the fluids of the mouth, and the constant admission of fresh millions of organisms to the scene of action, are necessary to their active life.

In conclusion, I would again urge the absolute necessity of properly comprehending the nature and life, and mode of development of micro-organisms, before attempting to demolish by mere phrases hastily considered, observations which rest upon patient study, the proofs of which have been verified in many directions by independent observers.

With many apologies for trespassing at such length upon your valuable space,

I remain, Dear Sir, faithfully yours,

ARTHUR S. UNDERWOOD.

GELSEMIUM SEMPERVIRENS IN FACIAL NEURALGIA.

Dr. Spencer Thompson, of Torquay, thus replies to a correspondent in the *Midland Medical Miscellany*: My usual dose, unless I have reason to know or believe the patient is very sensitive, is *M* xx., repeating in an hour if there is no relief, and if there is no giddiness or affection of vision, I may give a third dose in four or five hours; but it is rarely required in suitable cases, and I seldom give less than *M* xv. I have found *M* v. relieve in a very sensitive subject. I mention 'suitable cases,' for my own experience has told me that gelsemium has little curative effect in any neuralgic affection but that involving the teeth and alveoli of upper and lower jaw. In such it often acts like a charm."—*The Dental Record*, London.

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ORIGINAL COMMUNICATIONS.

ANNUAL ADDRESS BEFORE THE AMERICAN DENTAL CONVENTION, AUGUST, 1883.

BY F. Y. CLARK, M. D., D. D. S.

Gentlemen of the American Dental Convention:

Former presiding officers have in times past eulogized us for what we have done and what we are doing, and were it not for the thorns that beset our path, which are avoided or skipped, I assure you I would not consume valuable time, or inflict your patience with the addition of one word to what has by eloquent tongues been formerly said. I may say, however, we are not now as in former years, when we had no college, no journal, no society, no library, no State law, no system of study—nothing with which to construct a scientific and honorable profession. On looking back through the long shadowy vista of years to when first I entered the wild and almost untrodden path that led to the practice of dentistry, I am surprised and almost lost in wonder at the heroic undertaking. Then, as some of you are aware, every practitioner's knowledge or what he knew (which was precious little) was kept as secure as if locked within an iron safe, and when any little bit of information was imparted, it was for a price, or as a very great favor, with a solemn promise that it must be held as a profound secret; and the younger or more ignorant, in order to capture any

item of interest or practice from the older or more knowing ones, had to do it through stealth as a thief, and if found out was not unfrequently denounced as such. Those were the halcyon days of spiral springs, wire plates, ivory teeth, turn-keys, extracting and transplanting. In some sections it was considered very irreligious to have a tooth replaced; the loss was providential—a mark of God's displeasure, and should not be corrected. Once, in my early practice, believing that a neighboring dentist had some secret in the preparation of amalgam, I called to know what he would take to impart it. Fifty dollars, and a bond not to practice in the same place, was the answer. On leaving, his office boy, who overheard the conversation, whispered that he would show me all about it for a dollar. The offer was gladly accepted, and the great secret consisted in mixing coin filings with a little mercury. Some years after this, when we got to using porcelain teeth, few of us, with the exception of those entering from the jeweler's bench, knew much about soldering. I remember calling on another member of the craft, and, very unusually, was informed he was glad to see me; that he had a soldering case on hand and wished me to drop the water *on the plaster to keep the teeth cool and from breaking* while he applied the heat with the blow pipe. At first I thought him a wag, or that he wished to draw me out, but on seeing several teeth with silver wire imbedded in a lump of plaster as large as a croquet ball, and a little canal back of the teeth to receive the water drops, I saw the whole was a reality, and asked if he ever succeeded in this way. "Oh, yes," said he, "with soft solder and a soldering iron; but as this is a particular case, I wish to use silver solder, and fear unless the water is carefully dropped the teeth may break." This man was doing quite a lucrative practice and, considsidering the times, I'm not blamable for leaving him with my cash account twenty-five dollars ahead for showing him what little I knew about soldering.

In those days, in many large towns and villages in some sections, there were few local dentists. Practice was mostly done by itinerants, remaining from a few days to a few weeks in a place, as practice held or waned. He who had the best and largest number of letters from M. D.'s, preachers and teachers, and who could make the greatest display of instruments, specimens, etc., generally came off first best. But sometimes all was not like "making love," or "hay in fine weather." About this time a few years of my life were confined to itinerancy and, at one time, when in a small out-of-the-way town in Mississippi, I was

doing quite well and having a good time with the boys and girls, when a buckeyed fellow from Ohio came along loaded with testimonials and an immense display of instruments and specimens. I believe, when looking back now, that we were about equal in ability; that it was about "tweedle dum and tweedle dee." I had a few weeks the start and was pretty well anchored, but his numerous letters and testimonials, with the display of beautiful instruments and a huge out-door specimen show case, fully counterbalanced the start. Of course we became rivals at once, and in no time every one in the village became interested and espoused the cause of one or the other. Being a member of the largest church, a kind of a church leader, and a good singer, made my rival the more dangerous. To get even in these matters I secured considerable puffing by doing some gratuitous work for the editor of the village paper, including the extracting of several roots and one sound incisor in order to insert others. As was the custom, I removed the root of the sound incisor, and dropped the crown in alcohol preparatory to using it as a pivot tooth, should occasion occur. Not long after this, a regular bowie-knife rough, who in a fight had broken one of his teeth, called to have it replaced. This man, although a desperado, was a very important character—a man of money and of influential connection, being, besides, a great talker. I found the editor's tooth a perfect match, so I used it, and the patient, paying his bill, went away delighted, vowing I was the greatest dentist living, and that my rival ought to get a *warning to leave* for his presumption or impertinence in attempting practice in the same place, and, I believe, had I expressed a wish to this end, the warning would have been given. But somehow it got out that he had the editor's tooth in his mouth, and as they were sworn enemies, it made it more disagreeable. Worse than this, the root not having been perfectly treated, commenced giving trouble; still worse, the whisperings about the case got to the editor's ears, and he informed me he wanted his tooth; that he knew where it was and that I must produce it within a stated time. But, worse than all, my patient, so loud in my praise, not getting relief, put himself in the hands of my rival, and I was quietly informed that, as soon as the patient was able to get about, I was to be taught a new way of inserting. I thought of many ways out of the scrape; to get the tooth I would have to kill the bowie-knife fellow, and if I failed to get it, there was the editor to fight; and if in any way I cleared these dilemmas, there was the new lesson to face. I was about even with the place finan-

cially, and after a sleepless night and dreams of bowie-knives, pistols, and all the armor of individual destruction, decided on Gil Blas' policy, and moved to a town about one hundred miles away in another state, which, in stage-coach times, was a long and safe distance. My ancient rival is now somewhat advanced, for he was ten years my senior, but is still living, occupying a high position in the ranks in Cincinnati, Ohio; and, should this ever get in print and meet his eye, I hope he will make an honest confession and let us know *how he worked up the bowie-knife chap, and if and how the editor got his tooth.*

I relate these little episodes of early practice to bring before you more forcibly the condition of our profession in these early times, that we may compare with the present, and feel thankful for the many advantages that now surround us; for, in the way of schools, dental literature, machinery, professional societies or conventions, and all the auxiliaries that make up and lead to a high order of scientific attainment and skill, we have advanced for the time beyond any profession that ever existed. It is unnecessary to go into detail to show this. You are all too familiar with our present statistics not to know it. But while we have thus advanced, and become in many sections so immense that we have, proteus-like, to branch out in several heads as specialties, let us stop and ask if this is a healthy growth. Are there no excrescences, deformities, or hidden imperfections, that should be removed? Yes, indeed, there are many, and failing to call your attention to them or pass them over as is usual, would be far more pleasant and agreeable; but this would be wilfully neglecting a duty becoming and befitting the position in which you have placed me.

First, let me call your attention to the condition of our colleges. They come far short in many respects of what they should be. The published requirements, as sent out all over the land, read well, but are rarely enforced or adhered to. The great fight is for the largest number and not for high order of attainment. According to the various announcements the requirements are from two to three years under a competent preceptor. But how few, how very few, of the great number turned out every year have received such instruction? To avoid or get around this most important of all requirements some institutions consider one term, or the instruction of a few weeks for an extra consideration in the office of some one of the professors, equivalent to the two or three years, *and thus candidates are received and graduated, and colleges made preceptors.* Any one who has been with a good preceptor two or three years must know something of

practical dentistry. I would rather this than two years in any college in the land. Mention could be made of diplomas being granted to young men who never had a preceptor, and who would fail in securing a license from any competent examining board of any State, but time will not allow detail. If a law existed which could be enforced, so that a charter could be withdrawn or suitable penalty inflicted for each and every violation, then it would be far better for college, student, and profession. It seems as though something of this kind will have to be done, and perhaps the best way to accomplish it is for our State and National societies to agitate and recommend it to our Legislatures. *Is it not as right and just to regulate colleges by law as it is to regulate those who practice the profession they teach?*

A second evil to which some attention should be called, is our dental depot system. The time has come when at least our disapproval should be urged to the monopolizing spirit of leading dental manufacturers; otherwise, our profession will become in many respects subservient to their wishes. Thousands may individually suffer the same or similar wrongs, but individual or single efforts will not right them. Number and unity give courage and strength, and therefore, amid the din of the times, political turmoil, strikes, rings and monopolies, when all is feverish excitement for gain from the Presidential chair to the smith at his anvil, when the whole fleet of fine arts, to whose moralizing influence we must look for all our better hopes of intellectual and social excellence is in danger of being wrecked in this monopolizing stream of corruption, it behooves us to see that our bark sails free. Much could be said on this subject, but as it is rather an outside issue, it is merely brought up for further discussion and action should you deem it worthy.

Another trouble closely connected, and with which the artistic and experienced operator encounters considerable vexation, is our artificial teeth. While they have improved in shape, they have fallen back in naturalness of shade and toughness of body. Many of the old natural shades, so easily procurable many years ago, cannot now be had. A snowy-white, saffron-yellow or sky-blue, are readily obtained, but when some pet case is on hand, and some of the delicate natural tints which characterized the Stocton or Jones, White & McCurdy teeth are wanted, we are more apt to find them among an old lot on hand than in our dental depots. Last winter, on making inquiry as to the disappearance of many of the old tints, I was informed by a reliable employé that the shades are not added now by hand with a

brush as in former years; that all is done in the mould. If this is so, the sooner they get back to the old way and give us some of the lost shades, the better.

Again, much might be said as regards toughness and strength, for we all know they are not as tough as the plate teeth before the use of rubber. Frequent breaking puts patients to unfair expense and annoyance, and is frequently a serious reflection on the dentist. Therefore, let us again request our manufacturers to go back and regain the strength and lost shades.

But while picking flaws in our auxiliaries or tributaries, let us for a few moments look to ourselves and see if there is nothing undone that might be done. The old Spaniards, wishing to deter ambitious mariners from what they considered useless venture and research for unknown lands, inscribed on the rock of Gibraltar, the gate-way to the ocean, "Ne plus ultra"—nothing beyond. But when America was discovered they quickly obliterated the "*ne*," and had it read, "*plus ultra*"—more beyond." So we may say of our profession. There is more beyond, for, with all our science, advancement and improvement, the greatest discovery of all is yet to be made or satisfactorily demonstrated. Our America is yet beyond. I allude to the real and true cause of dental caries. We of the germ theory believe we have made the discovery, but it would seem as though we are unable to demonstrate this to the satisfaction of the majority. Deductions from microscopical investigations give strong reasons for believing that the misty shroud which has so long obscured scientific vision from a better view of the real and true knowledge as to caries, has been at last sufficiently rent to give a more satisfactory and intelligent view of the agents at work. As this is one of the live topics of the day, and everything pertaining to it is of vital interest, it is with great pleasure your earnest attention is called to the two valuable papers which will be read during this session—one by Dr. Boynton, on "Fermentation and Putrefaction," and the other by Dr. Stockwell, on "Micro-Organisms the Essential Factor in Dental Caries." Without some knowledge of these subjects, little or nothing is known of life, death, and disease, and these papers, from earnest thinkers and able investigators, will richly repay careful attention.

It seems in place, before closing, that mention of one or two of our journals, and a few words pertaining to this convention, should be made. As you know, it has been asserted and believed that no dental journal could sustain itself independent of depot or college

interest. This has always been a serious reflection. For, from the very nature of things, such a journal cannot be considered technically professional. This has been seen and felt by many of the best men in our ranks who, unless interested individually, financially held aloof; but it is safe to say there is no longer occasion for this, as we have now at least two independent journals, unhampered with depot or other interests. One of these, the New England Journal, has been in existence several years, has run the gauntlet, and is now on a safe foundation. It is liberal, scientific and professional, and no one who wishes to keep up with the live topics of the times can afford to be without it. The other, the Independent Practitioner, is now wholly dental, conducted in the interests of dentistry, and is what its name implies, independent, and therefore entitled to our confidence and support.

This convention, launched away back about 1854, richly laden with the good things and glad tidings of the profession, has sailed through storm and calm nearly thirty years, and, looking over the log, or as much of it as is now in our possession, leads to the belief that there are many matters which would be interesting and profitable to bring to notice, but time will not permit. For many years this staunch old ship, then the pride of our profession, sailed without competition; but, after a time, many thought the law regulating passage, or membership, was not sufficiently exclusive. Owing to this and minor grievances, the American Dental Association was launched, which received a large percentage of business, and is still in commission, doing good service. Notwithstanding this, the American Convention made her yearly trips, successfully weathering every storm, until, within a few years, her navigators came near losing her in the building of the National Congress. But, weathering this worst of all gales, she has at last made her twenty-ninth annual trip in safety, and is now safely at anchor in the harbor at Saratoga. On close inspection, although not up in many respects to the artistic requirements of the day, her hull is good and as sound as ever; and now that State Laws have been passed and none can take passage unless regularly or duly qualified, the main objection that was urged formerly being thus removed, there is little or no reason why this grand old craft, if properly repaired and navigated, should not be as profitable in all respects to the profession as in her most prosperous days. To this end, it is earnestly requested that a committee be appointed to carefully examine and report, if in their judgment it is best, to alter and repair, so

as to place this good old ship in first-class commission, or to give her an *honorable funeral, and rebuild;* and that this committee report at an early hour, so as to give ample time for due and decided action.

In conclusion, gentlemen, I trust something said will to some extent repay your kind and earnest attention, and that the same attention to other matters will enable you to leave feeling benefited and repaid for attending.

GOLD CROWNS FOR MOLAR AND BICUSPID TEETH—AN ARTICLE OF MANUFACTURE.

BY DR. M. RYNEAR, NEW YORK.

[Read before the American Dental Convention, at Saratoga Springs, N. Y., August, 1883.]

Mr. President and Gentlemen : To all observing practitioners it is very evident that the practice of attaching artificial crowns upon natural roots has taken a decided hold upon the attention of our profession, and it may be safely asserted we are rapidly approaching a new departure in artificial dentistry which will, to a great extent, if not entirely, do away with plate-work and extensive contour fillings.

It must be conceded that could our practice be relieved of the accumulation of clasps, collars, bands, etc., which have been devised for the support of materials coming in contact with the oral cavity, upon which artificial teeth are attached, and also of the inhuman and dangerous practice of packing gold for several consecutive hours, a great advance would be attained. The filthy and unhealthy condition of mucus membrane, which unfortunately is too often the result of the continual use of artificial plates, cannot but be productive of great injury to our patients, while the practice of packing gold, particularly in contour work, in order to produce a filling at once useful and ornamental, such time is necessarily expended and vital energy consumed, as must, if continued, prematurely and permanently impair the health of our best operators. Many of the most skilled and earnest workers in our profession have been zealous to bring about some improvement in this direction. Drs. Richmond, Bonwill, Weston, Buttner, Hows, Brown, Litch, and others, have designed different devices for this purpose, each possessing in a varying degree both beauty and utility. Much could be said in favor of each individual method ; they claim our careful consideration, and shall receive such support as their merits may demand. They will be tried in the balance, scrupulously criticised, and in time prejudices will be forgotten and the fittest will survive.

What do we need? A material which can as nearly as possible be made to take the place of the natural organ, can be firmly attached to the roots of teeth—a non-absorbent, one not subject to the corrosive influence of the mouth, simple in construction and capable of being readily adjusted.

The device which I here present to your notice, it is hoped, possesses these important requisites, and is especially designed for molars and bicuspids.

It consists of a metallic crown, preferably gold or platinum, stamped and drawn from one unbroken piece of metal, and intended as an article of dental merchandise.

The cusps or grinding surface of these crowns are exact counterparts of the human teeth, while the surrounding surfaces or sides conform to the lines of their necks.

Three sizes of each crown are made, enabling the selection of one which will so nearly fit the outline of the root as to require but a slight compression of its sides to perfect it.

When the articulation is normal, the crown can readily be made to articulate by removing, with festoon-cutters or file, sufficient of their length at different points.

In cases of abnormal articulation, the top or grinding surface should be removed with spring-saw, after which the lower, or band portion, may be fitted to the root and the grinding portion replaced with wax —or, closing the mouth, the crown will adjust itself. Both pieces should then be removed together and, after embedding in plaster and sand, be reunited.

Should some slight alternation be needed in the occlusion of the cusps, this can be readily accomplished by first flowing solder in the interior of the crown at such points and afterwards removing from its outer surface whatever may be required.

The attachment of gold crowns to the roots of teeth, when the natural crown is partially or entirely lost, is an operation the practicability of which has already been thoroughly tested.

In the hundreds of cases where they have been used, success always followed when good judgment and care was bestowed. Such being the case, it is but reasonable to presume that the principal obstacle to their more general use has been the want of time to properly construct them.

Up to the present, the more generally accepted method of performing this work has been to first carefully fit a small strip of gold to the

root and cement the ends with solder, thus constructing the band or sides—the cusps or grinding surface being swedged and afterwards soldered to the band.

This operation necessarily consumed considerable time, and was attended by many difficulties. The utility of the work was also seriously impaired by the stiff joints caused by the solder, it interfering with the perfect adaptation of the grinding portion of the sides.

The following advantages are claimed for the manufacture of crowns over those made by hand:

First: They are made from one unbroken piece of metal—no solder being used, thus enabling *a perfect adaptation of all its parts.*

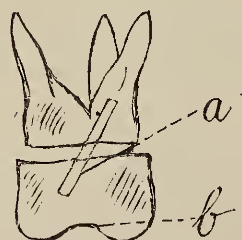
Second: They relieve the dentist of the necessity of constructing them, thereby saving annoyance and time to both the operator and patient.

Third: The operation is more perfect in every detail and presents a better appearance when completed.

Fourth: It places in the reach of all that which heretofore has been confined to a limited few.

Thanking you, gentlemen, for your kind attention, I submit the crown to you, believing it is destined to occupy in this class of work the same relative position as porcelain teeth do to plate work—no more, no less.

NOTE. In applying the crown, the following method is advised: Take an impression of both upper and lower teeth, articulate and remove plaster from around the margins of the affected tooth to the depth it is desired the crown should pass beneath the gum. By fitting the crown first to this plaster model, very little trouble will be found in adjusting it to the root.



A small gold or platinum screw should be inserted in the roots at such an angle as indicated by *a* in the drawing, and a hole made in the crown at some accessible point, say *b*, to allow the escape of surplus cement. Should sufficient of the crown remain to form an under-cut, no screw will be required. Care should be taken to thoroughly dry the tooth and a small quantity of powdered oxide placed upon the margin of the gum to absorb whatever moisture may still remain. Mix oxide phosphate to the consistency of thick cream and partially fill the interior of the metal crown; also place a small portion upon the root,

being careful to cover the pin or fill the under-cut. Now carefully adjust the crown and close the mouth to insure its proper occlusion. Before the cement hardens, care should be taken to remove all surplus that might escape around the edges of the crown beneath the gum. The hole in the crown can be filled with gold at any time after the cement hardens.

A HISTORY OF DENTISTRY.

BY GEORGE H. PERINE, D. D. S., NEW YORK.

[Continued from page 273.]

French Practitioners and their Methods in the Present Century.

Although the improvements which were made in operative and mechanical dentistry during the latter portion of the eighteenth and the first few years of the present century did not follow one upon the other in rapid succession, and were by no means numerous, it must at least be acknowledged that many of them were exceedingly valuable. What surprises us not a little, however, is the fact that human and animal teeth, mounted upon hippotamus ivory and other substances, continued for so long a period to constitute the material from which artificial dentures were made.

To Debois de Chamant, a French practitioner of considerable celebrity, is credited the invention of porcelain teeth. He published, as early as 1789, a dissertation on the advantages of employing incorruptible material in the manufacture of artificial teeth. It has been asserted that the idea of porcelain teeth originated with an apothecary named Duchatean, but it is now generally believed that Chamant was the inventor of them, he having obtained a patent upon them in both France and England. The invention was violently opposed by many practitioners, with whom Chamant maintained a warm controversy for several years. He subsequently went to England, where he practiced his profession until a short time before his decease. His invention was not generally adopted by the specialty, who adhered to the old method, until Tonzis produced finer and more perfect porcelain teeth; many of the fixtures made by him were considered at the time unequalled in any part of the world.

Prominent among French writers was Baum who, in 1800, published a very elaborate treatise on the first dentation. It was pronounced a

very able production. He also issued in 1806 a treatise on the semiology of the mouth, and in 1808 wrote a series of articles on the diseases of the teeth. He possessed a keen perception, and was throughout his life a careful student.

Joseph Jean Francois Le Maire did much to assist the profession in its progress. He was born at Mayenne, March 8th, 1782. His father was a prominent surgeon in Brittanny, and young Le Maire doubtless inherited many of his talents from him. He completed his medical education in Paris, and soon after turned his attention exclusively to the practice of the specialty of dentistry. He made a number of inventions and improvements in dental instruments, and was also the author of the following works: "Treatise upon the Teeth Physiologically," "Natural History of the Diseases of the Teeth," "Memoirs Relative to the Art of Dentistry," and "The Ladies' Dentist," a book intended for the perusal of mothers, and containing advice to them, and information relative to the care of their children's teeth. Le Maire was dentist to the King of Bavaria, a Knight of the Legion of Honor, and a member of the Order of St. Herbert. He died at Maison Alfort, Feb. 22d, 1834.

Louis Laforgue, although a graduate of medicine, devoted himself almost exclusively to the practice of the specialty of dentistry in Paris at the opening of the nineteenth century. He was a man possessed of a very generous nature, and contributed his services gratuitously to the poor of the Department of the Seine. The writings of M. Laforgue contain many observations and precepts held by sound practice. In one of his productions, he advanced the theory that many of the diseases attributed to the oral cavity are really the outgrowth of constitutional defects. Most of his writings were published in Paris between 1788 and 1816.

J. R. Duval was a dentist of distinction, and a very able writer. He published between the years 1802–28 several dental volumes (a list of which will be found elsewhere), beside which he at intervals contributed able articles to the professional journals of his day. He was born at Argentan, in Normandy, November 12th, 1758, and received a thorough medical education. He was a member of the Academy of Medicine, and died in Paris, May 16th, 1854.

Another prominent French dentist at the beginning of the present century was J. B. Gariot. He was the author of "A Treatise on the Diseases of the Mouth, Comprising its Structure and Functions, the Means of Preserving it in Beauty and Health, and Operations Apper-

taining to the Dental Art." This excellent work was published in Paris in 1805, and was subsequently translated into English. So prominent did Gariot stand in his profession that he was appointed dentist to the King of Spain, member of the Royal College of Surgery at Madrid, and associate member of the Society of Medicine, Paris.

In 1807, a work entitled "The Arts of the Dentist," from the pen of M. Maggiolo, made its appearance. It won much popularity and is even now held in considerable estimation as a book of reference.

"A Treatise on the Anatomy and Physiology of the Teeth; or, The New Theory of Dentation," was issued in Paris in 1817. The work was very highly spoken of at the time, and still holds a favorite place upon the library shelf. E. R. Serres was its author.

Passing over a number of French practitioners and writers of more or less prominence, we find ourselves drawing nearer our own time, and the names of Blandin, Legros, Magitot, Forget, Oudet and others, stand prominently before us as able contributors to the modern literature of the profession, whose works have been translated into English and published in this country.

That the specialty of dentistry, in comparison with other branches of the healing art stands, and has for some years past, high in France, cannot be denied. That its necessity to the welfare and comfort of mankind is recognized, is apparent from the advancement which has been made in its practice and the improvements which are constantly being introduced by the French profession generally.

About 1835, a law was enforced in France requiring of those desiring to practice the specialty of dentistry the production of a diploma of M. D., or that of *officeur de sante;* and in 1879 a society was organized styled "*Le Societe Syndicale des Dentists,*" with which many of the more prominent French practitioners have connected themselves, and there is every reason to believe that this society will do much toward the still greater elevation of the specialty, in whose interest there are two journals published at the present time in the French Republic. Recently, M. Tallebois submitted to the Municipal Council of Paris a petition for the appointment of dentists, whose duty it would be to give the pupils of the public schools professional attention gratuitously. The petition was favorably received, and an ordinance meeting its requirements was almost immediately passed, and it is believed that a similar law will be at no very distant day enforced in every city in the French Republic.

[To be continued.]

MICRO-ORGANISMS THE ESSENTIAL FACTOR IN DENTAL CARIES.

BY C. T. STOCKWELL, SPRINGFIELD, MASS.

[Read at the Saratoga Meeting, August, 1883.]

In a paper which was prepared about one year ago on the subject of Etiology of Dental Caries, I made an attempt to summarize the results of then recent investigations of certain chemists pertaining to this question which seemed to strongly controvert the grossly chemical theory that, up to that date, had been advocated and supported by a very large class of the profession. An attempt was also made to collate the results of microscopical observation and research, in relation to dental caries, by very eminent investigators. Very liberal quotations were made from their own reports and correspondence, showing a substantial agreement in, at least, the statement that "Micro-organisms play a very important part in every case of dental caries." Reference was also made to some of the results of scientific workers in the collateral branches of investigation that, in the opinion of the author, seemed to have an important bearing upon the inquiry under consideration.

The grouping, or orderly arranging of these facts—or what in the light of that stage of the investigation seemed to be facts—served to form a *premise* upon which was based a series of "inferences" that were deemed to be the *logical deductions* of said premises. That these inferences were opposed to the chemical and favorable to the germ theory must, it is still claimed, be chargeable to the stated facts by the different scientists quoted rather than to the *logic*.

This being true the "*inferences*" of that paper are, of course, open to such modifications as may be made necessary by any subsequent revelations of scientific investigation.

The discussion of the question of dental caries which has been so general during the past few months, not only in the dental journals throughout the world, but in nearly if not quite all the societies, is sufficient evidence of its interest and importance, and it is to be devoutly hoped that investigation and discussion may not cease until the character and definition of dental caries is clearly settled and understood.

To one who at all understands the claims of those who hold that micro-organisms are an essential factor in dental caries the *mis*understanding and confusion that appear in nearly all the discussions is amusing if not discouraging. Much of this misunderstanding and

confusion on the part of those who are reported as opposing the germ theory of dental caries arises, seemingly, from the lack of a clear, concise and sharp *definition* of caries, or, perhaps it may be said, from the confusion of ideas with reference to the distinction between—more or less remote—*predisposing conditions* and real caries itself. A great many things have been cited as *a* cause of dental caries, and—accepting the common understanding of the term—with a good deal of pertinence. In my own studies of this question the conviction has grown upon me that we ought to drop the use of the word "cause," or "causes" altogether. We *know* nothing of causes. When we attempt in real earnest to seek out the "*cause*" of any stated condition, we must at once find ourselves in a maze of phenomena reaching back indefinitely and infinitely into the great "before." We see, simply, phenomena, and know, only, that it is the sequence of a preceding phenomenon, a link in the endless chain of events, the *cause* of which is as unknown and unknowable as time and space to all save the "Great First Cause." From a given condition, or event, we may trace the *series* of phenomena, to a limited extent, and note what appear to be *essential factors* in the train, but we fail to reach the "cause" of the phenomenon. One stage of the process succeeds another in regular order and each *stage* may be labeled by an appropriate name implying the *state* of the process at a given point in its onward course.

What, then, is true dental caries? Just what is the condition of the tissues when in a carious state? The question, please note, is not: What is the "*exciting* cause" of caries? Neither is it: What are the predisposing conditions? The latter are legion. But, recognizing the long train of predisposing phenomena, just where and at what stage of the process does *real* caries begin? At what point, exactly, in the series of phenomena can a line be drawn at which we may say, here caries proper commences.

Let us remember that every destructive process is not caries; that a congenital defect is not caries; that abrasion or erosion is not caries; that a lowered "vitality" of a tooth is not caries; that the effect of "medicines," acids, etc., *without the intervention of some other factor*, is not caries; that even a tooth may, in part or as a whole, be dead and yet not carious. Without wishing to seem presumptuous, or attempting to force from the term an unwarranted definition, I will reiterate what I have several times stated and written as my convictions: *Dental caries does not begin until the putrefactive process of an*

organic portion of a tooth is set up. The putrefaction may be confined, if you please, to a single minute fibril, or a portion thereof, but even then, and not till then, can caries be said to have begun. Please note carefully that I do not use the term *fermentation.* Bear continually in mind the fact that there is a very important difference between the results, as well as the process, of fermentation and putrefaction, especially in so far as the two processes affect the teeth. Remember that the product of fermentation is always an *acid*, while the product of putrefaction is always *alkaline*, and that both processes are impossible when *micro-organisms* are eliminated. And so, when Magitot and his earnest disciples claim that the "exciting cause" of caries is an acid that results from the fermentation of food substances, they are at once confronted with the inevitable micrococcus as an essential factor to the process. The same is equally true with the putrefactive process. Whichever horn of the dilemma they seize hold of, the "*coccus*" is there and spoils the process if he is kicked out.

Even our friend, Dr. Watt, cannot inaugurate his hypothetical, nascent, nitric acid process without the indispensable help of the despised bacterium, much as he may wish to ignore or cover up the fact.

The theory—grossly chemical—formerly held by many, called the "pickling" process is no longer advocated; thus it appears that even in the *chemical* theory micro-organisms are an essential factor and among the foremost of factors, for the necessary fermentation process is dependent upon a certain class of low organisms, and if *they* are absent, or are destroyed by antiseptics, no caries can follow.

Let us now review, briefly, the investigations of our microscopists relating to this question. Have recent investigations made it necessary to materially modify the views held by "germ theorists" a year or so ago? From a careful reading of all these reports, and with a purpose to arrive at truth alone, I am forced to answer, No. To some of you who have studied the several very valuable papers of Dr. Miller—who alone has reported from this special field within the past year—this claim may seem unwarranted. The conclusion is based, mainly, upon his *observations* instead of his deductions.

In my paper of a year ago, the microscopical data was largely furnished by Messrs. Underwood and Milles, of London. You are, doubtless, so familiar with their report that any recapitulation will be unnecessary. Dr. Miller has amply confirmed and verified the observations of Messrs. Underwood and Milles. He has also entered into *details* to a greater extent than they, at least so far as their observa-

tions have been published, but he does not controvert their observations at a single point. Their *deductions* differ somewhat, it is true, but we have to do with *observations* not *deductions; facts,* as revealed by the microscope, not *opinions* of the various microscopists. And here allow me a little personal explanation. Dr. Watt recently stated that he does not consider me "an original investigator, or capable of becoming one." Very well; I am sure we agree in this most cordially. It has little to do, however, with the question at issue. I would simply remind him that I have nowhere, and on no occasion, claimed to be an "original investigator," but that, on the contrary, I have on different occasions, in private and in public, as well as in print, disclaimed any such pretense. I have simply made an effort to *collate* such facts as our best scientific investigators from the different fields have given us and, by grouping them together in relative order, have endeavored to ascertain if there existed such harmony as the laws of nature and science require. Law is always harmonious, and if a series of *claimed* facts do not harmonize, the *claim* is not well supported in reference to some one of them. Deductions made from a standpoint overlooking the various channels of scientific investigation are, perhaps, quite as likely to be in harmony with all the facts as those which are based upon a single line, however real the purpose may be to render an unbiased opinion. Great honor is due the earnest worker who wrests from the mysteries of nature new truths, but the natural results of all this human striving after knowledge may be summed up in one word: philosophy. Facts and philosophy go hand in hand—the latter being the simple sequence of the former—with every brain sufficiently active to apprehend the true import of the facts.

Now wherein do the observations of Dr. Miller differ from those of Messrs. Underwood and Milles? I cannot find that they differ in any essential particular. Dr. Miller has carried his investigations further and, as far as reported, with greater detail. They are especially valuable and reflect very great credit upon the investigator. He deserves the honor of the entire dental profession and, more than that, of the scientific world as well. It is no less valuable because it verifies the observations of the gentlemen previously referred to. He finds micro-organisms present in all cases of decayed dentine, as did Messrs. Underwood and Milles. So overwhelmingly is this fact established that no man—to-day—dares deny or even question it. The only question now is as to the *details of their action.* Don't forget that fact. It is a very important point gained as the result of the discus-

sion of this question and introduces a new and stubborn factor into the consideration of the etiology of caries. There is one other point to be noted also, viz: *Nothing has been found beyond the organisms*, not even an acid or any combination of acids and lime-salts. This must be admitted, too, by all unbiased disputants, and should be kept constantly in mind and accorded its due weight and force. What, in brief, is the condition of decayed dentine as shown by the most recent investigations? In a general way, it may be stated as follows: There is, first, an outer layer, very irregular on its inner border, of infected dentine—dentine in which micro-organisms abound to a greater or less extent and to a greater or less depth. This outer layer or infected zone is succeeded by a territory of varying depth that *seems* to be free from organisms but in a somewhat *changed* condition—"softened," as Dr. Miller terms it. Under the glass it appears to have retained to but a limited extent the coloring matter with which the specimen was stained, gradually shading off less and less until the healthy or transparent border is reached. Beyond this layer is the non-affected or healthy dentine. In other words, there seems to be, in many cases at least, a territory of dentine between the portion that is *absolutely healthy* and the territory where *micro-organisms abound* that is *changed* somewhat, but not absolutely infected; and it is around this zone of changed, but not infected, dentine that the whole war of discussion and hypothesis now wages. Dr. Miller *supposes* it to be "softened" by acids or a "*something*" not yet known. Right here comes in his unknown quantity or factor, out of deference, I presume, to the investigations of Prof. Mayr, which demonstrate that no acids *are* there or *have been* there.

Again, what may be learned from general sources regarding the operations of bacteria and organisms of like character and habits? Upon what do these organisms live? What are they after? What do they consume as food? They certainly do not "chew up" lime-salts. Protoplasm, as with organic forms of every description, is the object of their search and natural pabulum, necessary for their maintenance and reproduction. This is taken by the process of osmosis or absorption as with plant life in general. Now let us look at the histology of a tooth for a moment. Wherein does the protoplasm of a tooth reside? In the bioplasson, or protoplasmic fibrils of Heitzmann and Bödecker and in the glue-giving connective tissue within the meshes of the bioplasson threads. This none can deny. No one has ever claimed that these organisms are to be found in *perfectly normal* den-

tine, but it is shown clearly that they are present in the tubules beyond the line where the *mechanical structure* is broken up.

This being true, namely, the presence of organisms at the terminal portions of the fibrils, and their activity in *absorbing the protoplasm from* the fibrils, what else could be expected than that, for a certain distance from the *actual presence* of the organisms, a changed appearance of the tissue should be the result as appears under a high magnifying power in the specimens of Dr. Miller's? That such specimens should show a slight opacity at this point, an atrophied condition, or even *devitalization* of the fibril or fibrils is, seemingly, a most reasonable conclusion; the least interposition of a "mysterious something," unknown and unknowable, is entirely unnecessary.

Thus it is easy to conceive that the masses of organisms in the outer layer, or zone, may first *devitalize* the bioplasson in the tissue immediately beyond their presence and, secondly, instigate the *putrefactive* process that follows in the wake of the devitalizing process. Instead of this being an *inflammatory* process—taking the common interpretation of the term—it may be the opposite; a condition or process better expressed by the use of the word atrophy.

To my own mind the phenomena shown in the investigations of Dr. Miller, and termed by him "the zone of softened dentine," is more satisfactorily explained in this way than by attributing it to some "mysterious unknown cause." The "unknown cause" *seems* to be sought for because of prejudice against the "bugs," and because it is recognized in the light of to-day that acids and all other heretofore ascribed causes fail to "fill the bill."

This explanation being even proximately true, we should expect to find a condition described by Dr. Miller in one of his latest articles, viz: "In all the preparations which I have examined with reference to this question I have met with very few cases where the boundary line between the infected and non-infected parts is not of the most tortuous and angular nature conceivable." Please bear this in mind when you read his remark that this "is a fact hard to reconcile with the germ theory of caries." It seems clearly reasonable that these minute organisms should invade a single tubule, or a series of them, deeper and faster than neighboring tubules, thus presenting the characteristic "tortuous and angular" surface or border line; whereas, if the invading agent was a destructive acid the *tortuosity* and *angularity* would never appear at all. If the germ theory is properly understood this condition of specimens would appear as a verification of

the theory instead of being "hard to reconcile" with it. It certainly does not harmonize with the acid theory.

I said that the cause of this "softened zone" of Miller is the question around which the war of discussion and hypothesis is being waged. Perhaps one other question should be included. It is said that in perfectly normal tissue it is not conceivable that micro-organisms should invade enamel without the previous action of an acid to open the way to the dental fibrils or, at least, to the interstices between the enamel rods. The trouble with this statement relates to the words "*perfectly normal*," or "*perfectly formed*," enamel. What is "perfectly formed" enamel? It may seem perfect to the unaided eye and yet be found far from perfect when examined with a microscope. A congenital defect as minute as the minutest micrococcus may be the fatal weak point which, with the favoring condition of a lowered vitality, will furnish a starting point sufficient to involve the destruction of the whole tooth. Just at this point especially comes in a general *mis*understanding of the position taken by those who hold that micro-organisms are an essential factor in dental caries. I, for one at least, have never denied that acids may be, and are, a destructive agent to teeth. I only claim that the effect of acids simply is not *caries*—that some other agent must come in before the process which is *properly* termed dental caries can be said to have begun, and that this agent is low organisms. I do not dispute the proposition that, if between two *perfectly* formed or sound teeth a particle of food substance is lodged, the product *may* be an acid as the result of the process of fermentation, and that this acid *may* dissolve lime-salts, thus opening the way to a more fatal putrefactive process. This is not denied as possible, or even probable, but we claim most positively that if all germs or organisms are excluded there would be no fermentation to produce the acid, or putrefaction to produce the more serious result, caries; so, in any case, the prophylactic treatment should be antiseptic. Furthermore, I claim with equal emphasis that while admitting the action of acids, such action should be classed with the *predisposing conditions favorable to* caries; that the action of acids alone cannot be considered a part of the process of true *caries* any more than a *congenital defect* or a *fracture* can be so considered. They stop short of caries. In other words, as previously stated, caries does not begin until the *putrefactive* process of an *organic* portion of a tooth is set up, and that this putrefactive process is dependent upon the action of low organisms; that a single

fibril, a series of fibrils, or even the whole tooth may be *dead*, yet in no sense *carious*. Just so long as the destructive process is confined to the action of an acid, or acids solely, no *caries* is present or possible. The result is simply an abrasion or erosion.

Of course we all admit a long and almost endless train of complex predisposing conditions *favorable* to caries, such as hereditary tendencies, congenital defects, a weakened "vitality," etc.; and all of these are to be considered as—in their proper place—relating to the phenomenon of caries; but, for practical purposes, we want to know what is the real, active, present devil with whom we are to grapple, and in the *absence* of which dental caries, in fact, is impossible. This real devil is embodied in the real, active, lower organism invariably found on the field of battle, and to the extent that he can be overcome or modified in action, to that extent caries will be overcome and modified and this general malady eliminated.

In *absolutely* perfect enamel I am ready to admit the probable necessity of a dissolving of the lime-salts in order that the organisms may gain access to the organic tissue; but *perfectly* formed enamel is an exception, not the rule of the present day. In such cases the following process may be suggested as, at least, possible: Micro-organisms of a certain class produce fermentation of food substances, etc., fermentation produces acids—the acids may dissolve lime-salts and, consequently, expose the organic tissue to another class or classes of organisms which, by absorbing the protoplasm of the tissue, devitalizes the tissue to a greater or less extent and thus prepares it for the action of bacteria termo, which organism sets up the *putrefactive* process when, and not before, caries proper can be said to have begun.

This, of course, is offered as a suggestion, merely, of the process. The *details* of the action of low organisms are not yet sufficiently determined to warrant any positive conviction. The point maintained is that micro-organisms are the *essential factor* in dental caries, and that in order to combat *it* successfully our treatment must be *intelligently antiseptic*.

The true test of all theories is when they are put into actual practice. If an intelligent application of a theory fails to produce results in accordance with such theory, there is a mistake somewhere. If, on the other hand, the theory is applied strictly in accordance with the principles of such theory, and the results obtained are such as must be expected if the theory is based on scientific facts, then we have the verification of the theory.

Perhaps it would be asserting too much to claim that the germ theory as applied to dental caries has been thus verified in my own practice; but this I am prepared to say: I have results that were never obtained by any other means. And it is the testimony of many others also. One of these gentlemen is a veteran of over forty years' practice, who says that he now can practice intelligently and, as results show, with a certainty that he never before experienced.

If this can be said now when prophylaxis in accordance with the principles of this theory is in its very infancy, what may we not hope for when the whole question of the antiseptic treatment is reduced to an absolute scientific basis? Much has been done and more is being done in the scientific world along this line, and the antiseptic treatment as applied to dentistry will come in for its share of the results.

Take, for instance, carbolic acid: It is claimed by Dr. Koch, and other eminent authorities, that a stronger solution of this acid is necessary in order to be effective as a germicide than has been supposed. It has been stated that one twenty-fifth of one per cent. is sufficiently strong, but according to the experiments of Dr. Koch a five per cent. solution, at least, would seem to be necessary to destroy these organisms with the accompanying germs—a stronger solution being necessary to destroy *germs* than the organisms themselves. I allude to this fact simply to show that much still remains to be done in this direction, and that any failure to secure such results as we may expect may very well be ascribed to our yet imperfect knowledge of antiseptics, rather than to a fault of the theory per se. In this field we have a very interesting opportunity for study and experimentation, one that promises greater results to the dental practitioner in the way of prophylaxis than any other of which I can conceive, and one in which we, as a profession, should engage ourselves for the benefit of a suffering humanity.

CORROSIVE SUBLIMATE.

The antiseptic properties of this well-known and powerful drug, which were first made known by the researches of R. Koch, is now coming rapidly into general use. M. Tarnier employs it freely in his maternity hospital in Paris; every attendant on entering the labor ward must wash his hands and arms in a solution of corrosive sublimate (one in a thousand). The patient's genitals are bathed in a solution of the strength of one in two thousand; this is also the strength required for all vaginal injections.—*Medical Press.*

SOCIETIES.

THE TWENTY-NINTH ANNUAL MEETING OF THE AMERICAN DENTAL CONVENTION, HELD AT THE TOWN HALL, SARATOGA SPRINGS, N. Y., AUGUST 14, 15, AND 16, 1883.

(Continued from page 330.)

Discussion of Dr. Stockwell's paper. (See this number.)

Dr. S. A. White: I am not prepared to discuss the paper. I only noticed in the mouths of patients whom I have treated for disease of the gums, using carbolic acid, that I had very little to do; by this fact my attention was first called to this treatment, and I found that after using this preparation, although I did not prescribe it as a prophylactic, that it did act so; I found also the same in the case of my children. A little boy of ours has had to suffer all his life; he had paralytic troubles, his temporary teeth were very much decayed, and I found the gums were in a diseased condition. I used this preparation of carbolic acid—1ʒ carbolic acid, 2℥ glycerine, and 3℥ of water. I am safe to assert that it not only corrected the troubles about the teeth but it acted as a positive prophylactic to the decay of the teeth; that led me to make experiments in my practice, and I have been using the preparation of carbolic acid as a prophylactic against decay in those frail teeth that we meet with so often.

Prof. Charles Mayr: I am often asked, What is the best antiseptic? and even under the danger of not appearing original, I will repeat what I have said: The very best antiseptic is bichloride of mercury (H_gCl_2) or corrosive sublimate. I myself had once the opportunity to make a few though not very decisive experiments. The water in our city is very bad, and at one time the commissioners had quite a number of experiments performed about it. At that time I took some very bad water from the pond and carried it home to ascertain the trouble; it came from a peculiar water alga; the water which I had taken was about as thick as cream from this particular alga; I poured some of it in about half a dozen glasses, and for mere private interest I made a few experiments with poisonous substances. I poured in each of the glasses, holding 50 ccm. (about two ounces), two drops of different poisonous substances. Well, the experiments as such were not conducted with all the scientific rigidity, and I did not keep any proper record of them, but some fifteen minutes after I had poured the two drops of the bichloride solution in the water, all

the little movements of the alga had ceased; while the one with the two drops of the solution of arsenic not only was not killed but did thrive more and kept longer than all the other solutions. Among the products of dry distillation, carbolic acid has been recognized as a very powerful antiseptic; there are several kinds of "carbolic acid," which form a kind of series, just as we have the fat acid series, to which formic acid, acetic acid, butric acid, stearic acid, etc., belong; these different carbolic acids differ from each other by a CH_3. The more CH_3 they contain the less they are soluble in water, but the greater seems to be their antiseptic power, so that you see for practical purposes the two just counterbalance each other.

Dr. F. Y. Clark: To look superficially at a tooth, we often may pronounce it sound; but look at the same tooth with a powerful magnifying glass, and you would be astonished how porous it would appear to be. Where there is putrefaction you will find lower organisms; they are not animals, they are plants and live by absorption; if we dry the substance, they must cease to live. They absorb the bioplasm, disintegrate the lime-salts and cause the discoloration.

August 15—Clinic.

Before the clinic, Dr. Rich showed his new water motor, which seems to work very satisfactorily and softly. Dr. Clifton, of London, England, showed a peculiar drill; to prevent the drill slipping through the nerve canal, it has a little enlargement back of the edge. Dr. Rynear, of New York, exhibited a collection of new caps, made according to a newly patented method. Dr. Rich's office contains a very attractive collection of live birds who sing and chirp while he is operating, and certainly do a great deal to draw away the attention of the patient. Such little devices are something more than essential in the success not only of a dentist but of other professional men.

Morning Session, August 15, *opened* 11.30 *A. M.*

President F. Y. Clark in the chair.

Several communications are read, among others, one from Dr. Mills, declaring his inability to be present; also, Dr. Bartholomew, of Springfield, sent a dispatch that he could not be present. Dr. Ambler withdrew his paper in favor of one from Dr. Rynear, of New York.

[To be continued.]

EDITORIAL.

THE NEW ENGLAND DENTAL SOCIETY.

The annual meeting of this society occurred at Providence, R. I., on the 4th and 5th of October—President Fillebrown in the chair. That it was a most notable meeting, no one who was present will gainsay. It was notable in point of numbers present, notable for the large increase of its membership—some fifty new names were added to its list, notable for the adroitness and expedition of the presiding officers, notable for its harmony and singleness of purpose, notable for the completeness of its programme of proceedings and the undeviating manner in which it was adhered to, notable for the number present of high professional character and ability, notable for the industry and the lack of wasted moments, and, above all these essentials to a good meeting, it was notable for the high order of the papers read and the discussions that followed.

The chief interest centered about points of difference on histology and embryology between Prof. Garretson on one side and Drs. Williams, Andrews and Atkinson on the other. The difference was sharp, clear and earnestly stated, but as amicably discussed as earnestly stated and illustrated. It was an illustrious instance of "Doctors disagreeing," and in a most earnest and positive manner defending their positions, but "loving each other none the less." As the two papers are to be published we shall not attempt a report, but refer all interested to the full text. Prof. Garretson's paper we shall publish in our next number, and Dr. Williams' may be found in a future number of the Cosmos, profusely illustrated. Both of these papers deserve the earnest and careful study of the entire profession. We regret that we cannot give a verbatim report of the discussion on this subject, but as that is impossible we shall not attempt a condensation, for it would be impossibe to do it justice. Suffice it to say, that the position held by Prof. Garretson is based upon a "philosophical" view, while that of Dr. Williams is based upon actual and original microscopical work, largely from the human embryo. Perhaps it is simply viewing the matter from the "two sides of the shield," but, however it may be, a lively discussion is likely to follow by our experts in histology and embryology, and our "border line" of knowledge in reference to this matter is pretty sure to be carried outward a little into the misty realm that lies beyond.

In this connection, we can hardly refrain from a word of congratulation that our profession has come upon a time when the *chief* interest of its meetings is centered around questions like this, rather than as of only a few years since when if, perchance, some *prophet* happened among us and, in spite of ourselves, attempted to lift the veil that shrouds the "how" of our being, we listened to his—to us—meaningless words and looked our blank astonishment, or considered his burning, eloquent words as evidence of a "slight insanity" to be received only as a "good joke," to be laughed at as would the jargon of an innocent crazy man on the street corner. We are also to be further congratulated that our profession now numbers not a few men who are able, by virtue of their own investigations, to call in question the statements of accredited authorities, and demonstrate by undeniably good work the soundness of positions taken in *advance* of the literature of the present day along this most interesting line of original scientific investigation. It is to such men that the credit is due for the acknowledged advance of the standard of our profession, rather than to those who see virtue only in our meetings when they deal in the *methods* of performing some, so-called, practical work belonging to the daily routine of our professional duties. These are not to be overlooked; they should be commingled with the scientific; but that the scientific is coming to the *front* is a welcome and hopeful sign of the times and bespeaks a brighter outlook for the future of the profession.

Two other papers were read at this meeting: One by Dr. George A. Mills, on "Pyorrhœa Alveolaris, its Origin, Etiology and Treatment;" the other by Dr. George L. Parmele, subject, "Concerning Records," in which the Dr. described and illustrated his method of keeping a record of all his cases, without any books, but by means of an ingenious use of cards, properly and conveniently arranged in a compact and readily accessible manner. The method attracted a good deal of attention and, when properly understood, is seen to be simple, concise and very convenient, as well as novel. Our readers will have an opportunity to learn more of it at no distant day.

Prof. Garretson's paper was illustrated by numerous blackboard diagrams, and Dr. Williams' paper by a stereopticon, supplemented by a microscopic exhibition under the direction of Drs. Williams and Andrews—showing different stages of tooth development. "Subjects" for a clinic having failed to appear, the morning session of the second day was devoted to a discussion of some of the papers read,

the election of officers, incidents of office practice, exhibition of new implements, etc.

Remarks were also made by Dr. Fifield, a noted surgeon of Boston, and Dr. C. F. Terry, of Milan, Italy, an American who, after twenty years' residence and practice abroad, has returned to this country for a brief visit. We shall give the remarks of Dr. Terry to our readers in a future number of this journal.

The convention adjourned at one o'clock and proceeded to the Continental Steamboat Company's dock, where it embarked on the "Day Star" for a sail down the bay and a clam bake at Silver Springs, as the guest of the dentists of Rhode Island.

Boston was by vote chosen as the place for the next meeting one year hence.

The following are the officers for the ensuing year:

President, Dr. Wm. Barker of Providence; Vice-Presidents, Drs. James Lewis of Burlington, Vt., and J. B. Coolidge of Boston; Secretary, Dr. A. M. Dudley of Salem, Mass.; Treasurer, Dr. G. A. Gerry of Lowell, Mass.; Librarian, Dr. G. F. Waters of Boston. Executive Committee, Drs. D. M. Clapp of Boston, Thos. Fillebrown, Portland; F. Searle, Springfield; S. G. Stevens, Lynn; R. R. Andrews, Cambridge.

AN ANNOUNCEMENT.

For some weeks past certain changes relative to the future management of this journal have been contemplated which promise to be of interest to its readers. Plans are now so far matured as to warrant a partial announcement. The originators of the JOURNAL were of the opinion that it should have a personality and individuality entirely uninfluenced by the association of names connected therewith who were in any way connected with the profession in whose interests it is published. While this plan possesses many advantages, there exist obvious reasons that have led, finally, to a decision to announce the names of those who are, hereafter, to compose the editorial staff.

The success of the JOURNAL has thus far been such as to now warrant the effort to greatly extend its influence; and, believing in the wisdom of the old proverb, that "In the multitude of councilors there is safety," the "staff" has been somewhat increased so as to include therein the names of many well-known and eminent professional men—men who have at heart the best interest of the profession, believe in its advancement and are willing to "lend a hand," even

though it may be at the sacrifice of personal interests and should involve much labor. The list comprises the names of some who are engaged in original scientific investigation, while others are teachers and demonstrators of operative dentistry, or hold recognized positions as successful practitioners. Two have no practical connection with dentistry as a profession, one being a chemist, and the other a physician of large experience as a practitioner; but both are investigators of subjects largely allied to dentistry. All of these gentlemen are pledged to contribute to the success of the JOURNAL in the future and will endeavor to make it an essential to every progressive practitioner. For prospectus, see another page of this number.

THE CONN. VALLEY DENTAL SOCIETY.

The annual meeting of this society occurs at Springfield, Mass., on the 7th and 8th of November. An interesting programme is arranged and a good meeting is, as usual, sure to be realized.

Dr. J. L. Williams, of New Haven, Conn., will repeat the lecture he gave before the New England Society, at Providence, on Embryology, and it will be profusely illustrated by stereopticon views. This alone will amply reward any one for attending the meeting.

Dr. E. Parmely Brown will be present and exhibit, by clinic, his new "Crown."

The various sections are generally expected to have reports to present.

THE DENTISTS' MUTUAL AID SOCIETY.

The above society was formally organized, on the 18th of September last, at Kansas City, Mo., and, we are informed, starts off under favorable auspices, with every prospect of success.

The Constitution and By-laws are at hand and appear to have been carefully drawn up and the result of much care and good judgment. Full particulars may be obtained by addressing the Secretary, Dr. R. I. Pearson, 543 Delaware St., Kansas City, Mo.

Our readers of course know that the word "cotton-wood," on page 307, last number, was a misprint for *cotton-wool.* The types play ridiculous tricks sometimes in spite of the most painstaking proof reading.

OHIO STATE JOURNAL OF SEPTEMBER, '83.

"A word fitly spoken is like apples of gold," is the motto heading an essay of Dr. George Watt on "Nature and Ethiology of Dental Caries." What are apples of gold good for? For nothing else but to be recast and recoined into dollars. The comparison of Solomon may have been excellent for his time, though we cannot see what they used those apples of gold for, but to the modern mind they are not just the climax of usefulness, and if Dr. Watt's article is not worth more, it is not worth much. Dr. Watt wants his definition and classification of decay accepted, else no salvation! He talks of two varieties of decay—the one in which the cavity of decay contains soft semi-gelatinous material, the other decay he finds of black color. If men like Dr. Miller and others speak of decay, they never speak of anything else except the soft variety, at least we have not been able to discover in their writings anything which indicated that they had analyzed decay of black color. The experiences of all, except Dr. Watt, go to the effect that this black decay is very rare. Dr. Watt tries to make fun of what he himself calls self-evident truth, namely: that experiments tried out of the mouth are not of the same value as when tried in the mouth; that is at least the substance of it. If it is a self-evident truth, why does not Dr. Watt stick to it, and why does he try to prove that experiments tried out of the mouth are the same as experiments tried in the mouth? Dr. Watt's "books and papers were burned in 1866 and the records of over three thousand experiments and observations were consumed."

Dr. Watt has yielded a step. To the question, Acids or Germs? he answers, "both." He says that putrefaction will go on and totally destroy the body, even if no "maggots" present themselves. In accordance with a former statement of Dr. Watt about the size of microscopical organisms, we have to conclude that Dr. Watt means by maggots bacteria, and we ask Dr. Watt if he has the *very slightest proof* that putrefaction is possible without bacteria, or "maggots," as he calls them. He always talks as if these two, bacteria and putrefaction, were two separate things, so that we might have one without the other, separately. He has not learned anything within the last ten years, if he maintains that. After his records were burned he probably shut himself up and let the world go one way and Dr. Watt the other way. Dr. Watt makes a grossly chemical mistake in saying that dilute hydrochloric acid dissolves bone phosphates without decomposition. He has not read anything of the chemical experi-

ments of Thompson about what the latter calls chemical avidity. Dr. Watt says that hydrochloric acid is very often "found" in the mouth, a statement which must be well proved before it is worth reading; but how it is "formed in the mouth" we would like to know still more. Do people eat strong oxalic acid, or sulphuric acid, or nitric acid? It devolves on those who write about hydrochloric acid in the mouth to prove it, not on those who never found it.

We are glad if Dr. Watt occasionally experiences amusment and glad if he derives it from decayed cavities. Now, if a dentist were cutting chalk with his instrument, it would cut soft and pleasant, and if a man should tell him that he cuts a substance with 99% of inorganic salts, while dentine contains only 72%, he would, by the logic of Dr. Watt, have to suppose that the man who says that chalk has 99% of inorganic salts is wrong. From the very first, when we made our experiments about the decay of teeth, we made the statement that the lime-salts are not dissolved in advance of decay; only Dr. Watt seems not to have read this until now. If Dr. Watt has made all his recent studies at the same rate, he is now in the chemistry of 1855, since he says he commenced about 1854. We have to chew the statement so as to fit the mental digestion of Dr. Watt; it might be worded thus: The lime-salts are present in the innermost sections of the decayed mass. The experiments described many times plainly show how this is proved. Dr. Watt is continually lecturing on chemistry! He may have known something twenty years ago. We are right glad that Dr. Watt loves his "nascent," and protects his sweetheart with loving fondness against the rude attacks of certain periodicals. They are well matched his "nascent" and Dr. Watt. Dr. Watt seems to confound in a remarkable manner nitrous acid and nitrogen peroxide. About the conversion of ammonia into nitric acid, we would like to ask Dr. Watt, who certainly has in his laboratory—if it did not get burned too in 1866 and has since been supplied by talk and words—a bottle with ammonia continually exposed to the action of the air, if he has ever found nitrate of ammonia in the bottle, providing he kept the bottle containing the ammonia away from the bottle containing nitric acid. There is a first-class chance for the ammonia to combine with the oxygen and form nitric acid; even the alkali is present for the "nascent" acid to combine with, yet we get no nitrate of ammonia. Is it not singular? Might not one think that something may be wrong in the supposition of Dr. Watt? Dr. Watt lives on the sayings of chemical authorities; he only quotes half of them and

thinks his fancy can supply the rest, but this shows only an unscientific turn of mind. There is no science in which so much of any reaction, even the most fundamental one, depends on circumstances as in chemistry. To give Dr. Watt an example of what circumstances will do: Dr. Watt supposes that acetic acid can decompose carbonate of potassa. We can tell him that it does not under certain circumstances. If he does not know it, we will communicate it to him in the next number. We would be glad to agree with Dr. Watt that alkaline reaction in the mouth is due to the presence of ammonia, if it was proved; but, e. g., saliva is alkaline in its reaction, yet this alkalicity is certainly not due to ammonia. That sulphuric acid causes blackness of decay is certainly one of the most monstrous suggestions ever printed by a would-be scientific chemist in a dental journal; we can not use a milder word. From the connection of this sentence, it would not be unfair to suppose that he believes the black spots in the stomach, after poisoning with sulphuretted hydrogen, of which he speaks, to be due to the sulphuric acid produced out of the sulphuretted hydrogen. Dr. Watt only *talks* chemistry; he never seems to experiment in chemistry, for he would find without difficulty that the black spots in the stomach are sulphide of iron from the decomposed blood and no carbon. If Dr. Watt had ever made experiments as to what a concentration of sulphuric acid is needed to carbonize organic tissues, his own theory about the sulphuric acid blackening the decay in teeth would seem to him childishly absurd; but as long as he does all his chemistry in print, the real chemistry of facts and experiments will remain unknown to him. Dr. Watt seems to think that the phosphate in the teeth is not the neutral common salt. Please give the formula or composition in percentage. We are glad to hear of a new phosphate called "bone phosphate."—If we did not have our own fun in it, it would be too much like wasting time to talk chemistry with one who did not keep up his studies.—Dr. Watt says sulphuric acid is not capable of dissolving or decomposing those salts. Sulphuric acid of such a concentration that it does not act on the phosphates never occurs in the mouth except of suicides and children of nurses who thought they would give them a drink of syrup; therefore, all the talk about it is unnecessary. We are glad that we can agree with Dr. Watt in what he says about dental erosions; it is so simple that he himself gives the correct explanation of it. That starch and saccharine substances should undergo acetic fermentation in the mouth is very improbable, and the time required for that is much longer than

there is reason to suppose those substances to be left in the mouth. The most common acid of this fermentation is butyric acid. We are glad to say that, in spite of the little respect we may have of Dr. Watt, as a modern chemist, his journal contains much that is well worth reading, and that his zeal for theoretical investigation is worth its due; only we have to answer unfair attacks in a corresponding mood of mind. But Dr. Watt ought to be fair and he will find us as fair as he ever can be. Dr. Watt gives "a —— —— lie" to something in the "N. E. J. of Bovinity." If we were not already accustomed to poor boomerangs from Dr. Watt, we hardly could have made out what he meant. Now a journal of chemistry is not written by chemistry but about chemistry, etc. Thus, also, a journal of bovinity is not written by bovines but about bovines. How impolite would it be to mention in connection with this fact that we wrote more about Dr. Watt than any other man? Dr. Watt, if he grows older and wiser, will find that his saloon-style of writing is a two-edged tool which cuts more the handler than the would-be victim. Another of the most unfair quotations of Dr. Watt is in respect to an article of ours on alcohol, which was written for a reader who has enough intelligence to see that the passage, "with 30% water," was a misprint, and should have been "water with 30% alcohol." If Dr. Watt could detect nothing in the whole article except the misprint we are sorry that we have shot so far over his head. The Ohio Journal, on pages 443 and 444, publishes a whole list of misprints and errata occurring in one of its own numbers in one of the preceding months. Otherwise, we are glad to mutually advertise each other, but we love fairness, and it is always painful to have to reply in a strong way to an unfair or crude attack; but so long as many readers like to see a little fighting, and as Dr. Watt kindly furnishes us with weak points of his, we shall be exceedingly glad to accommodate them.

"NEW MODE VULCANIZER" IMPROVEMENTS.

We are credibly informed that at the suggestion of Dr. F. N. Seabury, of Providence, the manufacturers of "Campbell's New Mode Vulcanizer" will make some changes in its construction which will render its use less annoying and tedious, and the results obtained more uniform and satisfactory. Also, that with each improved vulcanizer will be furnished "A Book of Instructions" which will embody the results of patient, persistent, expensive and, finally, very successful and satisfactory efforts on the part of Dr. Seabury in his experience with "The New Mode."

WHO ARE "QUACKS?"

"The persistent student never becomes a quack. . . . . . A very small proportion of the profession are careful readers of our dental periodicals—probably not more than one in ten. Without doubt a much larger number scan the journals for items of a practical sort, but never think of studying the matters of deeper import which require thought and patience for their comprehension and appropriation. Another class of persons, and probably comprising a greater number than either of those referred to, are those who usually confine their reading to the advertising pages. The latter two classes, and especially the last one, usually receive their journals as a gratuity. No dentist who has subscribed and paid for from two to four good dental journals, and carefully read them, can be a quack."—*Prof. Taft.*

A careful observer cannot think that Prof. Taft has underrated the number of the profession who "are *careful* readers of our dental periodicals." Strange as it may seem to the public in general, "one in ten" is probably all that the facts will allow. Are the *nine-tenths*, then, "quacks?" What is a quack? Perhaps "a medical pretender" is the best definition given, strictly applied; but, as commonly used, the word has a more general application. For instance, a dentist may be "a *medical* pretender" but an expert *mechanic*—men of such attainments are known in the profession—or one may be a *medical* expert but, nevertheless, a *mechanical* pretender—such instances are not unknown. Now, as far as *dentistry* is concerned, which is the quack? Perhaps neither; other considerations involved have to be taken into account. An expert in either department is pretty likely to be a "persistent student" of dental literature. To define a quack, however, as one who ignores the periodicals of his profession, is not far from the absolute truth. How can one who cares nothing for the "mirror of his profession" be anything else than a "pretender?" He, at least, soon gets a long way behind the "procession."

We know a dentist who, to an agent's yearly question: "What dental journals do you want this year?" always replies, "*Send them all.*" We hardly need to say that this man has a State-wide reputation as a most successful dentist. He simply commands patronage by virtue of his merit as a practitioner, and defies competition. He certainly is no quack, and the public know it.

Another case: We were requested a few days since, by a farmer, to

procure for him a copy of *Tyndall's Floating Matter of the Air*, a notice of which he had somewhere seen. Now a *quack* farmer may readily ask: What on earth does a *farmer* want of *such* a book? Well, we happen to know something of this farmer, and we know that the purchase and careful perusal of many such books is not uncommon. We happen to know, too, that he gets five cents per pound more for his butter, more per bushel for his beets, turnips, potatoes, etc., than his neighbors, who think he is an "odd fellow" to suppose that books have anything to do with farming, and that a library is a waste of money and time. They fail to see any connection between the *books* and the *extra five cents* per pound for his butter.

Now these are two simple instances that will bear some thought by those who think the literature of their profession is a thing of no importance. Success to-day depends upon the exercise of the brain along the *optics*, directed towards the "Outermost rim, and beyond," of scientific thought and investigation. The possessor of such a brain, whatever his special calling, is sure to be no quack.

MONATSSCHRIFT DES VEREINS DEUTSCHER ZAHNKUNSTLER.

(Monthly Journal of the Association of German Dentists.)

The journal is something of an organ of the German dental societies. It contains reports of societies from all parts of the empire. We think that there are hardly as many members of dental societies in Germany as there are societies in America. A very interesting article on amalgams is published, in which a list of analyses is given, as made by Dr. E. S. Wood, of Harvard. This list may have been published before, but we think it worth publishing again. We do not, of course, warrant the correctness of these figures.

Arrington's Amalgam—Silver, 40%; Tin, 60%.

Diamond Amalgam—Silver, 31.76; Tin, 66.74; Gold, 1.50.

Hood's Amalgam—Silver, 34.64; Tin, 60.37; Gold, 2.70; Iron, 2.90

Johnson & Lund's Amalgam—Silver, 38.27; Tin, 59.58; Platinum, 1.34; Gold, 0.81.

Lawrence's Amalgam.—Silver, 47.87; Tin, 33.68; Copper, 14.91; Gold, 3.54.

Moffit's Amalgam—Silver, 35.17; Tin, 63.01; Gold, 2.82.

Townsend's Amalgam—Silver, 40.21; Tin, 47.54; Copper, 10.65; Gold, 1.06.

Townsend's Improved—Silver, 39.00; Tin, 55.69; Gold, 5.31.

Walker's Amalgam—Silver, 34.89; Tin, 60.01; Platinum, 0.96; Gold, 4.14.

The following formula has been given by Dr. Ambler-Tees and is said to give excellent results:

Tin,	40	parts by weight.
Silver,	24	parts by weight.
Gold,	1	" "
Platinum,	1	" "

Gold, silver and platinum are first melted together with borax and kept liquid for five minutes; the tin is melted in a separate crucible and then the molten mixture of silver, gold and platinum is poured into the molten tin; the mass is speedily cast into suitable moulds and with a coarse file comminuted.

Two dollars received during the month of November will entitle every new subscriber to the NEW ENGLAND JOURNAL OF DENTISTRY from November, 1883, to December, 1884, inclusive.

BOOKS AND PAMPHLETS.

PROCEEDINGS OF THE CONNECTICUT MEDICAL SOCIETY,

At the Ninety-Second Annual Convention, 1883. Published by the Society—C. W. CHAMBERLAIN, M. D., Secretary, Hartford.

Dr. Chamberlain, after faithful service as secretary of this society for eight years, has now resigned, his last duty being the editing of this valuable volume of 235 pages, which is excellently printed in clear type. It will be extremely difficult, if not impossible, to find the man who will serve so acceptably in the position so long occupied by him. The marked improvement in the transactions since his election, as well as the unprecedented prosperity of the society during the past eight years, reflect great credit upon him. The volume contains a number of good papers upon a variety of subjects. The president's address, by W. G. Brownson, M. D., of New Canaan, entitled "The Country Doctor," graphically portrays, in verse, the trials and experiences of this hard-working son of Esculapius. Following this is the report of the committee on matters of professional interest in the State, containing, among many interesting cases, the history of a rare and peculiar case of chronic ulcerative laryngitis, reported by C. W.

Chamberlain, M. D. An illustrated paper by Prof. M. C. White, M. D., of New Haven, describes a new and improved form of micro-spectroscope.

Among the essays, which are on such subjects as "Aspiration of the Chest in Pleurisy," by Wm. H. Holmes, of Waterbury; "Complications in Labor," by F. N. Braman, M. D., of New London; "On the Nature and Treatment of Varicocele," by M. H. Henry, of New York city, is one by Geo. L. Parmele, M. D., D. D. M., of Hartford, entitled "Some Points in Oral Surgery of Interest to the General Practitioner," which treats of diseased conditions of the teeth and their surrounding tissues, as influencing through their nervous connections, the general health of the individual, causing dyspepsia, diarrhœa, constipation and other allied troubles. It urges the importance to the physician of a more extended investigation in a field of such interest in its relation to disease in general, and which might render more clear to them many obscure nervous troubles. It calls attention to the importance of the preservation of the deciduous teeth as aids to digestion during the years of growth and development, also to the deformities resulting from thumb-sucking, and touches, in closing, on the subject of extraction of teeth during pregnancy.

Embodied with the Transactions, are obituary notices of those who have died during the year, an alphabetical, and a list by counties, of members, a list of presidents since organization (1792) and of officers and fellows since 1876; also the code of ethics of the American Medical Association, charter and by-laws of the society, and an act to prevent irregular medical practice lately passed by the State Legislature. The society numbers 460 members. It has been decided to reprint the proceedings of the society for the first twenty-five years of its existence (1792 to 1811). Dr. Lewis of Hartford has what is believed to be the only complete set of Transactions in existence.

"AN EXAMINATION INTO THE CONDITION OF THE TEETH OF CERTAIN PRE-HISTORIC AMERICAN RACES." By W. C. Barrett, M. D., D. D. S., Buffalo, N. Y. A reprint from the Independent Practitioner for October, 1883.

This very interesting paper is the result of a visit, in June last, by Dr. Barrett to the Peabody Museum of Archæology, at Cambridge, Mass. We trust that this is, as we infer, but the introduction to a series of papers by the same author on this subject, and that he may be able to spend other "vacations" in pursuing the study of the history written on these "dry bones," collected for the benefit of science. Material having been furnished so largely, the figures and statistics available should not be allowed to go by default, and Dr. Barrett will earn the gratitude of the profession if he succeeds in tabulating all the facts to be found therein.

THE

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ORIGINAL COMMUNICATIONS.

DENTITION.

BY JAMES E. GARRETSON, M. D., D. D. S., PHILADELPHIA.

[An address delivered before the Annual Meeting of the New England Dental Society, at Providence, Oct. 4th, 1883.]

Prof. Garretson, in introduction of the subject of his remarks, alluded to the confusion found related with the descriptions and demonstrations of the various microscopic observers, asserting that no two were found to read the pictures of the slides exactly after the same manner. He congratulated the society on the fact that the evening was to show a micro-photographic exhibition and that thus his own views were to find an immediate contrast.

"The subject of tooth development," said the speaker, "is one which associates its interests with surgery quite as much as with physiology. To know how rationally to treat diseases of the dental organism is to understand what such organism is; how the teeth are formed, how they are nourished, how and with what their inflammatory perversions are allied. It is proposed this afternoon to offer a practical demonstration. To show how a tooth is developed out of a papilla. That a papilla is to be accepted as a body sui generis. That a tooth is not a dermoid structure save as this name applies to enamel, which

cap has its peculiarity by reason of an influence exerted on the common plasm of the pulp as this halitus passes through one tunic of mucous membrane to be received against and moulded by a second tunic. It is proposed to let the subject evolve for itself demonstration of the existence of a primitive dental groove, seeing that if an adult jaw be taken, and the inter-dental septi be cut away, there is found a big groove; and a big groove implies gradual enlargement of one which at some time must have been so little that no microscope could see it. Mucous membrane does not dip down, it dips up; this difference, as it is trusted the demonstration will show, is greater than that between tweedle-dum and tweedle-dee. Teeth, it is proposed to point out, for reason of the practical signification of the fact, have a three-fold nutrition, and that such vascularity is correlative by reason of anastomotic connection.

A tooth in its developed state is large when compared with one that has but a twentieth of its growth, a fact of difference conclusive of the truthfulness of a deduction that primarily there is a dental germ.

A dental germ is an organism peculiar and special to itself; it develops into and evolves the component parts of a tooth; it does this, and it does nothing else. When first seen, a dental germ is microscopic. When seen in that expression which is the meaning of its organic relations, it has surrounded itself with tunicæ, with dentine, with cementum, and with enamel. Dentine, cementum, and enamel are resultant of a common secretion, and this secretion lies with the dental pulp. There is no enamel pulp as propounded, and as is thought to be shown, by the microscopist.

Using now different colored chalks and the blackboard, let us pass without further preliminary remarks to the demonstration.

By dentition is meant the development of teeth. Teeth, together with the alveolar process, develop upon the bone proper of the jaws.

In the earliest days of fœtal existence, the jaws are planes of cartilage. These planes are overlaid by mucous membrane. Between the cartilage and the membrane the papillæ known as dental germs are first met with.

The period at which dental germs are earliest seen is about the sixth week of intra-uterine life. At this period, a little sooner or later, such germs are to be exposed by lifting the mucous covering from the basement cartilage. At all subsequent periods previous to eruption section through overlying parts exhibits their presence.

The alveolar process, with its many pits, is simply an osseo-spongy tissue, serving as a common envelope to the growing tooth-germs. In its origin it constitutes the primitive dental groove. This groove is never, however, a ditch, or depression, except as such an idea is conveyed by the pits and depth of an adult jaw. Neither are alveolar process and body of bone one except as regard is had to relationship. Alveolar process is a provision associated with teeth; as dental germs develop, so does it; when the teeth are lost, so also does it disappear. Alveolar tissue grows around papillæ; the dental pits signify obstruction. The papillæ are not first met with in a groove.

A dental germ is made up of a congeries of granular nuclei dispersed irregularly through a firm homogeneous blastema. It is not enclosed in a cell-wall, or membrane of its own; it is a hyaloid structure.

A developing germ carries with it overlying mucous membrane; the membrane hugging it closely. This covering, or envelope, constitutes a tunic; it is to be denominated coat first, or tunica propria. The relationship of this covering to a papilla is precisely that of parietal peritoneum to a knuckle of intestine in incarcerated or strangulated hernia. The shape of this coat is that of the papilla it encapsules. The simple and natural manner by which this tunic is secured by a developing papilla is to be recognized by observation of Sub-fig. 2, diagram 1.

While, after the manner described, a tunic has been secured by the tooth-germ, it is appreciated that the common mucous membrane has in no wise altered its relation to surrounding parts; it abuts closely all the circumference of a papilla; it is contracted, like an elastic substance, about its base; it associates from this base with adjoining parts.

Corresponding with the growth of a papilla is that of its alveolar envelope.

As such envelope is of sub-mucous nature, being an organization arising out of cells existing between the mucous membrane and plate of jaw, among which cells the germ lies, it is to be recognized that as this increases about the germ it necessarily carries around it a second coat, or tunic; tunica reflexa it is not unwarrantable to call it. This now becomes the dental relation; a germ, originally microscopic, has enlarged until it stands in shape and size the representative of a tooth; this germ is enveloped in a double sac; it is overgrown on all its circumference by tissue which later is to express itself as alveolar process

and gum. To understand how the second tunic is taken, reference is again to be made to the diagram, Sub-figs. 4, 5 and 6.

At this period the dental pulp, as the papilla is now to be called, having attained the size of the tooth-crown it represents, commences the formation of dentine. Before the attainment to full size by the papilla, there existed between it and its sac proper a halitus. This halitus, now that the congeries of cytoblasts, or nucleated granules, have obtained their full growth and secretive power, is replaced by a more highly endowed production; the work of matured cells. This secretion constitutes the future dentine. Calcification is progressive with secretion.

As this deposit deepens within the mucous envelope, so the pulp contracts until, finally, it stops at that certain point which maintains within the tooth a canal, or cavity, and a vascular and nervous pulp to occupy it,—this pulp being the contracted original papilla. The vessels of this papilla are wholly analogous to those of the ordinary papillæ of touch.

Why this secretion, in its organization, should assume the position of the elongated tubular cells which pertain to the structure of dentine, is not here to be discussed, and it is quite enough for our purpose to say that it is a law of form perhaps not to be fully comprehended, apprehension of which would, at any rate, have but little clinical signification.

The formation of dentine completed, the covering of it with enamel begins; or rather this deposit is, to a degree, coincident with the dentinal formation. Secreted by the same pulp which forms the dentine, the same secretion, some portion finds its way into and through the primary sac. As it passes through this sac, to be moulded against the second, it is modified by the epithelial surface, which constitutes the outer face of the tunica propria; this sac, as it is understood, being a mucous membrane. Between the enamel, thus formed, and the dentine, exists the primary sac; simply the modified mucous membrane, which we first saw as overlying the papilla. The sac of mucous membrane—tunica propria, as it has been termed—continues to exist between these two hard bodies, and receives and modifies, for the support of the enamel, the liquor sanguinis found in the dentinal tubules and intertubular structure. This tunica propria is the enamel membrane. It is from this that we receive impressions of pain when it becomes exposed by a break in the continuity of enamel.

In the process of tooth development, particularly at that stage when the hard structures are being formed, a grade of vascularity is present in the external sac which seems quite to have deceived microscopic observers, as these persist in viewing such congested and thickened membrane as the agent which deposits enamel, whereas, in reality, it serves here simply as a mould, and has its permanent office and meaning in the periodonteum, which membrane a moment of reflection will show to be the persistent remainder of the tunic after the crown portion has been lost in eruption of the tooth. Enamel is analogous with epithelium. The only place where dentinal secretion comes into relation with, and under the influence of, epithelial correlation, is where it passes through the tunica propria into the moulding interspace existing between this and the tunica reflexa. A tooth at large is not a dermoid structure; the enamel of a tooth is dermoid to the extent and expression that its characteristic is received frcm, ard is influenced by, a mucous membrane, as just described.

The growth of a tooth root, as its dentine is concerned, has precisely the history of the growth of the body. Such growth is associated with pyramidal elongation of the pulp, which, pushing upward the crown, extends upon itself the enamel membrane and tunica reflexa. This elongation, with its greater vascularity and vitality assumed as approach is made to the basement vessels,—combined with influences of a catalytic nature, existing by reason of anatomosing vessels running in from the circulation of the alveolar process,—modifies again the result obtained by the exudate passing through it from the dentinal pulp, the result being an approach to neighboring bone in the production of cementum. Analogy is found in nails and epiderm structures of similar signification and origin.

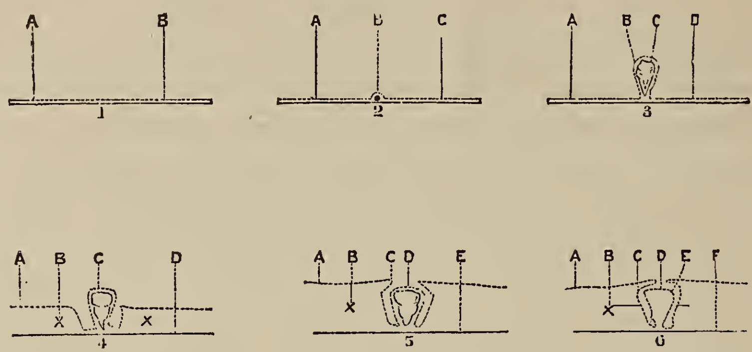
Periodonteum, as suggested, is the modified external sac, lost, of course, above the neck, as the tooth has emerged through it. See Fig. 2; all parts of a tooth are shown separately, yet in relation.

This is a very simple and easily understood explanation of tooth growth. The observations leading to the conclusions have been somewhat extensive, and the phenomena are certainly endorsed by general anatomical analogy. Let them be objected to, however, as undoubtedly they will be by the physiologist, they are irrefutable as all surgical relations with the teeth are concerned.

Illustrations.—These were drawn upon a blackboard, a description closely allied with the following accompanying. The tooth

selected is an inferior central incisor. Sub-fig. 1 shows two lines; A represents mucous membrane overlying B, a plane of cartilage.

FIG. I.



Sub-fig. 2 shows A, mucous membrane; C, basement cartilage; B exhibits the mucous membrane as it begins to be raised as an envelope—tunica propria—for the tooth-germ seen below it.

Sub-fig. 3 is diagrammatic of the mucous envelope—tunica propria—as it invests the germ, no reference being made in the drawing to the developing alveolar walls.

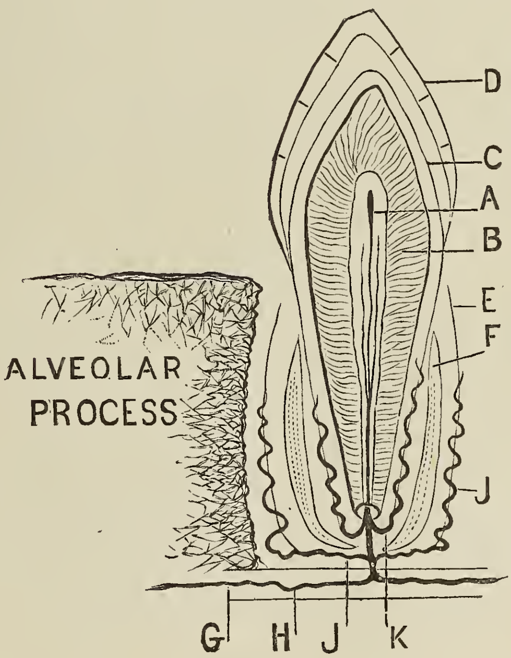
Sub-fig. 4 is diagrammatic of the idea of the manner of envelopment of germ by the second tunic—tunica reflexa. It is to be understood that ×× (B) is the growing alveolar walls, and that as this develops between the base bone and the covering of mucous membrane, it necessarily lifts the latter, but that in lifting it the tunica propria is not disturbed; hence, a second tunic, having as its eventual office the meaning of a periodonteum—*i. e.*, a bond of relationship between tooth and alveolus. The cut is to be understood as being purely diagrammatic. A, mucous membrane; B, alveolar process; C, tunica propria; D, base of jaw.

Sub-fig. 5, also diagrammatic, is designed to afford idea of a tunica reflexa about completed. The relation of the parts in this cut need alone, in order to be exactly as in nature, that the two tunicæ be in contact with each other, separated only by an intervening halitus, and that similar relation exists between tunica propria and pulp. A, mucous membrane overlying gum tissue which tissue in its turn overlies × (B) alveolar process; C, developing tunica reflexa, being part of the original plane of mucous membrane seen in Sub-fig. 1, and which here has been made to envelop the tooth-germ and its original tunic by reason of the developing alveolus of the germ represented, and of the other germs; D, tunica propria, gotten by the germ, as shown in Figs. 2, 3, and 4; E, base of jaw.

Sub-fig. 6 shows similar relations as in 5, except that here the tooth-germ is withdrawn from its envelope, and the parts stand exposed as would be shown by a transverse section. A, original mucous plane; B ×, alveolar process; C, tunica reflexa, which tunic is eventually to constitute the periodonteum; the portion above, or that portion which relates with the tooth-crown being lost because of the organ emerging through it in the act known as cutting. (The so-called ligamentum dentes is simply the thickened ring of the tunica reflexa, resultant of the remnant of the crown portion of this coat; part is absorbed, part contracts toward the root portion.) D represents the inside of the tunica propria; the whole tunic, as shown, is persistent, the portion above the line constituting the enamel membrane, the portion below the line relating the cementum and dentine. From this tunic it is, as understood, that the enamel receives its whole nourishment; it acts also as a part-feeder of the cementum.

Accepting the process of tooth development as here exhibited, it becomes understood that enamel has no special pulp as propounded by the histologists. It is also understood that it calcifies from the outside inward, and not from the inside outward. It is as well seen that it is a vital tissue nourished exactly as are other parts.

FIG. II.



A, dental pulp and its artery; B, dentine; C, tunica propria; D, enamel; E, periodonteum; F, cementum; G, canal in lower jaw; H, dental artery; J, branch of dental artery supplying periodonteum; K, branch of dental artery supplying tunica propria.

The description illustrates as well the manner and matter of periodonteal formation. It exhibits that a correct naming of that tissue would designate it alveolo-dental or alveolo-odonteal membrane.

Also it is made plain that the enamel membrane is not strictly dependent on the common pulp for its nutrition. It has another source of supply, namely, that received through the cemental portion of the tunica propria coming in its turn from the osseus-like circulation of the cementum derived from the periodonteum—*i. e.*, the persistent root portion of the tunica reflexa—from the alveolo-dental membrane and that gotten from vessels which come to it from apical vessels.

Here, gentlemen, I leave the subject, quite convinced, however, that it will not be so left by others who are to follow. I will add that I have studied the subject fully fifteen years, that I have seen every possible demonstration that microscope and micro-photograph can show, and that I am unwavering in the conviction that in the few and simple showings, I have given the true demonstration of tooth evolution. When to-night we see, as no doubt we will be shown, a half-moon-like body called the enamel pulp, be pleased to observe that the differences between that so-called pulp and the tunics standing before you on the board need for a reconciliation only that our microscopical friends develop the whole tooth in place of stopping at what is little more than its origin. To me it seems wonderful that the meaning of the tunica reflexa of the present demonstration is not recognized by the microscopist. It is quite as wonderful to them, no doubt, that I cannot see with their eyes.*

LOCAL ANÆSTHESIA.

We can speak with some authority on the benefits to be derived, in some forms of neuralgia, from the application of the following: ℞ chloral: hydr: ʒij, camphoræ ʒij. Rub well in a mortar until a fluid about the consistence of glycerine is produced, then add chloroform: ʒi and morphiæ sulph: 30 grs. and mix the whole. Paint on the course of the painful nerve. Of course we should not rely entirely on this application, but administer some of the usual anti-neuralgic medicines, such as quinine, quinine and iron, or arsenic, &c., internally.—*British Journal of Dental Science.*

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*The editor acknowledges his obligations to the Messrs. J. B. Lippincott & Co., of Philadelphia, publishers of "Dr. Garretson's System of Oral Surgery," for kindness in loan of cuts here used.

ON CERTAIN MICROSCOPIC ELEMENTS IN PULPLESS AND GUM-DENUDED TEETH, IN THEIR RELATIONS TO THE FILLING OF ROOTS AND THE RE-ATTACHMENT OF THE GUM-TISSUE.

BY J. EDW. LINE, D. D. S., ROCHESTER, N. Y.

[Read before the Dental Society of the State of New York.]

Since the discovery by Spooner that arsenious acid properly applied to the tooth-pulp would devitalize that organ, the filling of root canals has occupied a somewhat conspicuous place in dental theory and practice. The discovery in question is said by some to mark an epoch in the history of our calling, being regarded as the dividing line between old or ancient dentistry and modern or new. But if this discovery had ended simply in the destruction of the tooth-pulp, little would have been gained beyond the cure of tooth-ache without extraction and consequent loss of the tooth; and very much would have been lost in the rapid breaking down of the now poorly nourished tooth, the destruction of the osseous support of neighboring teeth, the drainage of the system by abscesses, and the poisoning of the oral secretions—and indirectly of the whole body—by the products of these outlets of badness. Happily it did not end here. The devitalization of the tooth-pulp was followed by its removal, whole or in part, and the more or less complete filling of the root canal, after or without medication, until the perfect filling of this cavity came to be regarded as a fine art.

The material of root-filling is not so important as formerly; the method of much more importance. Some were content to fill with cotton saturated with creosote or carbolic acid; some with cotton whose meshes had been filled with oxy-chloride of zinc; some with this only or a similar plastic; some with gutta-percha; some with metals, as lead, tin or gold, the latter ribbon-like or in roll-form, or wire, or some combination of the three. It was agreed to by good and bad operators alike that roots should be filled; that they should be filled to the apex; not beyond, for that would irritate the tissues of the alveolus and give rise to tenderness to touch, or possibly to inflammation and its various endings; not short of the apex, for thus would be left a pocket to hold shreds of pulp that might soon end in death, or to retain the juices of the neighboring tissues till time and other circumstances favored their decomposition, when would result the many too-well-known ill effects.

The expert at root-filling is confronted with a case of say soreness of an incisor. The slight off-color and other circumstances indicate

death of the pulp. Casual examination reveals a gold filling on one side. Our expert now begins his quiz: "I see this tooth is filled; when was it done?" "Ten years ago." "By whom?" "Dr. Blank." "An excellent piece of work. Did he destroy the pulp?" "Yes." "And fill the root?" "Yes." Our expert is now suspicious of a defective root-filling. Dr. Blank must have filled short of the end of the root, or beyond that point, or if just to the end, his materials must have been poorly selected and as poorly packed. He then removes the filling from the cavity of decay and drills out the root-filling, or because of the worthlessness of the tooth's associates, or its own without them, extracts it and finds a root-filling as solid and as perfectly made as possible with soft gold foil packed by hand or by automatic mallet—a root-filling that goes just to, not beyond or short of, the end. He pronounces it a perfect piece of work, and as he believes that roots perfectly filled never give trouble, he is puzzled. And well he may be, for within an hour of the operation in question he is called upon to extract, preparatory to the introduction of a plate, four pulpless incisors imbedded in healthy gums and process. On splitting these teeth for examination, as is his custom, he finds incisor A to contain the ideal root-filling, satisfactory in every particular, even to the odor of carbolic acid. Incisor B also contains a root-filling, but this falls short of the end, and yet there are no signs of pericemental trouble whatever. Incisor C is also filled, but in this the filling extends beyond the end of the root a full quarter of an inch. But there is nothing more out of the way in this than in cases A and B. Incisor D contains no filling at all, and as in the three already mentioned, indications of disturbance of whatever kind at or near the apex of the root are wholly absent. If his reasoning is confined to these four teeth he concludes that a defective root-filling, or no filling at all, is just as good as the best. Or he may conclude that there is something beyond the antiseptically treated and perfectly mechanically filled root that has hitherto escaped his observation. And in this he is more than likely to be right; for while the making of the root thoroughly antiseptic and the filling of it in a mechanically perfect manner are to be desired, even if not necessary to success, there are other things that sooner or later undo the best that can be done while roots remain in their places in the jaw. What these things are will appear further on.

Whether the result of purely mechanical causes, as the tooth-brush or an ill-fitting partial plate; or the attendant or follower of causes

pathological, as a low inflammatory, a suppurative or necrotic condition, traceable to deposits of tartar or constitutional peculiarities, the stripping of the teeth of their gum-tissue means death to the more superficial and exposed portions. It has been claimed time and again, publicly by the best and quietly by some of the worst men in the profession, that the reproduction of the gum-tissue and its attachment to the tooth, or its attachment and the re-attachment of tissue already on the ground, are matters of easy accomplishment, requiring merely time, patience and skill. The best men above mentioned do this, or claim to do it, by surgical means chiefly; while others, the baser or basest extremists, rely on the application of medicaments known to domestic medicine and prescribed to innocents ever since costermongers ceased to jump upon their mothers. We are more than willing to admit the ability of any one of fair skill in other things, having a reasonably healthful and consequently hopeful case, to reproduce more or less gum-tissue, and by no other means than time, skill and a well-formed lancet. On the other hand, we are but sparingly willing to admit that in the treatment of pyorrhœa alveolaris, or Riggs' disease, some are able not only to reproduce this tissue, but also to effect its union with diseased and gum-denuded teeth. We are thus "but sparingly willing," because we believe in many of these men, in their ability, their honesty to report faithfully what they see, or think they see; and yet it is no more than fair that something more than mere statement, or say so—something approaching demonstration should make its appearance, if only to bear these worthies out in what they have said in meeting and published in the journals. We do not say that the re-attachment of the gum-tissue to the tooth is impossible of accomplishment, that it cannot be done, that it has not been done; but we do say that there are certain things and conditions of things in the way that make the operation difficult and success doubtful. What these things are, and they do not differ in any essential from those hinted at in our remarks on root-filling, will be stated when we have considered for a moment the minute anatomy of the human tooth, which we now proceed to do.

According to the every-day notion of tooth-structure, a tooth is a mass of inorganic matter traversed in different directions by matter not inorganic, as in enamel; and in places and at times organized, as in dentine and cement. According to recent views, some of which are destined to rapidly and effectively supersede many now current, a tooth is an organized body having a lace- or mesh-like structure, the

meshes being filled in with inorganic matter, principally salts of lime. If from such a body a transverse section be cut just above the highest point of the enamel, and prepared for microscopical examination, there will be seen radiating from just within the pulp cavity numerous well defined, nucleated cells, closely connected with each other by so-called lateral processes, and sending one or more long, slender processes, or soft fibers of Tomes, toward, into and through the dentinal tubuli. If one of these processes or fibers be examined, lateral or sub-processes will be seen running towards and to neighboring processes, and by means of which all primary processes or fibers are bound together. If followed straight on, this primary process, or soft fiber of Tomes, will be seen to unite directly with one or more processes of the cell of a cemental lacuna, or indirectly by processes as fine as those sent off from the sides. Following the process of the cemental cell, we pass through the nucleus or nuclei, then through one of its peripheral processes, and finally through the mesh-like structure of other cells to the peridental membrane. This gives us a string of tissue connecting the pulp through dentine and cement with the membrane lining the alveolus; and this string of tissue will exhibit two or more nuclei or centers of assimilation, development and (in early tooth history) reproduction—the three cardinal characteristics of organization, no matter where found. Such being the anatomy of this part of the tooth, of course roughly stated, we are prepared to go further and discover if possible some of the changes that may occur, and in occurring bring to naught all that has been done and suffered by operator and patient respectively.

If the pulp of a tooth die or be destroyed, the first thing is to remove the remains, cleanse the root to the apex, render it antiseptic, so far as may be, and fill well from the end down. Suppose this done and the root does well for say ten years, as in our expert's case, and then, without apparent cause or provocation, becomes tender, aches, and after a few days develops an alveolar abscess. To what shall the failure be attributed? To mechanical interference of any kind? To accident? Neither of these. To the operator? No, for we know that he did his work well. What then? The answer is short: Death and decomposition of the contents of the dentinal tubuli, whole or in part, and the transmission of the irritation to and through the cemental cells to the peridental membrane, giving rise to inflammation and ending in abscess. It was at or near the pulp cavity that the trouble began, and it is here that a section from a tooth of the char-

acter described shows a difference in color, in the contents of the tubuli, in refractive power; and it is here that we find the line of demarkation, that line that sets off the living from the dead—what may be called the dead-line. It existed at the time of the preparation of the root for filling. On one side was living tissue, on the other more or less dead tissue, antiseptically soaked. But at the time in question death took a fresh start and set the line deeper in the dentine, or even in the cement close to the peridental membrane, and with the result stated. Without knowing why, attempts have been made to defer or prevent decomposition. The habit some dentists have of reaming roots from beginning to end is a good one, for by this means the dead contents of the inner ends of the tubuli and the diseased intertubular tissue are removed; but even then the dead-line may be a little beyond the reamed portion—just far enough to save a little dead material for future mischief.

Again, in the case of a gum-denuded tooth, we find dead tissue near the surface of the root, and in some cases, so far into the cementum as to involve the contents of the lacunæ. This being the case, what is to bridge the chasm between the gums, old or recently formed, and the contents of the lacunæ or (in the neck) the tubuli? It is claimed that the root should be scraped, cut away, excised, and the gum lacerated, and that then there will occur an exudation of plastic material which, undergoing organization, will re-establish nutritive and other relations between the tooth and its environment. Where this happens, circumstances must be favorable indeed. That it does not, cannot happen often, is apparent from the fact that a broad dead-line, a chasm must be crossed; and living tissue separated by such lowly organized structures as cement and dentine, and a thick film of mixed oral secretion, can rarely, if ever, come in contact—and union without contact of some kind and some thing is simply impossible.

In presenting these thoughts it is not with the intention of excusing in any way any man for doing questionable work, but rather to put him on his guard against those who, in the face of the nature of things, claim too much; and also to furnish him with a few facts in regard to things always beyond his control, and liable at any time to undo what has cost him long hours of hard and honest labor.

REMARKS OF DR. C F. TERRY, OF MILAN, ITALY, BEFORE THE LATE MEETING OF THE NEW ENGLAND DENTAL SOCIETY, HELD AT PROVIDENCE, R. I.

Through the kindness of Dr. Dudley, I received an invitation to attend this meeting, and it being the first dental meeting I have ever had the pleasure of attending in my own country, it will not be necessary to tell you how much I enjoy it. Thinking also that a few words in reference to the condition of the teeth in that part of Europe in which I established myself for the purpose of practicing dentistry more than twenty years ago may interest you, I volunteer these remarks.

Before going abroad, I had an idea that teeth were worse in the United States than in any other civilized part of the world, and had heard men in our profession, as well as others, express the same opinion. During the first three months after my arrival in Zurich, Switzerland, while waiting to pass my examination and receive permission from the authorities to practice my profession in their city, I had considerable time to walk about Zurich and the neighboring country and make observations. I was astonished to find that both in the city and country, among rich and poor, the condition of the teeth of the inhabitants was worse than in that part of my own country from whence I came. After years of practice in Zurich I found nothing to convince me that these first observations and conclusions were incorrect.

I was told by intelligent Swiss people (and the Swiss are generally well educated and intelligent), that the air and water of that part of the country was the cause of the early decay of the teeth. This idea prevails generally even among scientific men. Being often asked by patients if this was not the cause of decay, I generally answered that if the rats and mice living in the same house with us and taking the same water and air, also if the animals running wild in the neighboring fields and woods, choosing their food instinctively, were likewise affected with bad teeth, I should be inclined to believe this was the cause, but, so far as I have been able to ascertain, the teeth of these animals are just as free from decay here as in any other part of the world. Further, if the water and air were of such a nature as to cause fevers, or other diseases, that indirectly the teeth would suffer, but so far as my observation had enabled me to judge there was nothing in the air and water of Zurich and its neighborhood which could affect the teeth directly, as they claimed.

My argument for years has been that the two extremes of diet, too rich food or too poor food, are equally injurious to the teeth as well as health; and I think I found the proof of the correctness of this argument in the state of the teeth in the canton of Zurich. The poor in this canton are thrifty and economical, and generally succeed in laying up a little money for old age. Both men and women work in the fields and factories, therefore the women cannot devote much time to cookery. They rarely understand preparing a wholesome meal, even if they have the materials, and live upon what I consider a crude mess. Coffee is used extensively, also white bread—never bread made from unbolted wheat flour. Soup is a daily dish, so that they almost always boil their meat instead of roasting it. This boiled meat is not eaten, however, every day, and is seldom of the best quality, as meat is expensive. Wine made from the sour grapes of that part of the country is drunk extensively. It is something like vinegar. To drink this wine with a diet wanting in nourishment is the last thing they should do. It takes the phosphate of lime from their systems, instead of adding that which they need.

The habit of floating the food into the stomach on some kind of liquid, as a canal boat floats into the lock, is more common here, I think, than in other parts of the world. Perhaps on this account nature, finding no use for the teeth, tries to dispose of them.

The climate of this part of Switzerland is damp, foggy and rainy. I think there are a less number of hours of sunshine there, on the whole, during the year, than are enjoyed in most any other part of Europe.

The rich and educated people live about as they do in other parts of the world. Were I to judge from the number of confectioners' shops, I should say that they indulged in a good deal of that kind of food, as well as in a good deal of wine. I suppose fine white bread has been used longer in Zurich than in any other part of the world, as it was in this place that the fine silk bolter was invented, if I am informed correctly, with which millers were enabled to produce the superfine flour. Before this, a wire gauze bolter was used. This is interesting when we take into consideration to what extent the question of the use of Graham bread, and its influence upon the human teeth, has been discussed. I believe the teeth in this part of Switzeland are worse than in any other part of the world; they are so soft and chalky that it is difficult for a dentist to find a foundation on which to build a reputation.

It is claimed by some that climate has a great influence on the teeth, and that in the sunny South mouths partake of the perfect nature of the climate. I was therefore astonished to find in San Remo, Italy, on the Mediterranean coast—where I have practiced more or less for ten winters—that the teeth of the natives, rich as well as poor, were almost as bad as those in Zurich and its neighborhood. The climate of San Remo is dry. Statistics prove that there are a less number of rainy days there than in any other part of Europe. The place is a winter resort for consumptives. The thermometer seldom falls below 50° Fahrenheit, and then only three or four times during the season. The inhabitants are therefore seldom without fresh air, winter or summer, night or day, as their windows can be always open.

The San Remese are said to be among the most industrious and thrifty of Italians. Men and women work in the fields, the women generally doing the more laborious parts of the work and finding no time to take care of their children, homes or cooking. Their food is of a miserable kind, badly prepared, and of course they and their families are poorly nourished. As the lemon culture succeeds in this part of Italy, the children no doubt indulge in this sour fruit at an early age; and as their teeth are not in a normal condition they have not the resisting power necessary to ward off the attacks of the acid of the lemon, therefore soon decay. They say there, when asked the cause of the rapid decay of teeth, that it is the sea air and water. Wine is a common beverage, and is not as good as one would expect in such a climate. It is what an American, who has not been in the habit of drinking dry wines, would consider vinegar. These dry wines —this is the name for wines which are not sweet—may be wholesome for rich people who indulge in rich food, but I believe they are injurious to that class of people who take too little nourishment, as the poor on the continent usually do.

At San Remo neither rich nor poor take any care of their teeth; they would expect them to melt away instantly if they should attempt to clean them with a brush. I have looked into the mouths of grown people and children living on the hills near San Remo and I have not found a mouth, so far, where the assistance of a dentist was not necessary; and, as far as my experience goes, this is the case among the peasants in the mountains of Switzerland. To me, San Remo and Zurich have been particularly interesting, as I have thought and read a great deal about the causes of disease in the human system, and particularly in the teeth. I have lived in good climates and bad climates,

and the more experience I have the more I am convinced that what we put into our stomachs has more influence upon our health, and particularly on our teeth, than climate. The advantages of living in a warm, sunny climate are, that people can live with less artificial heat, are contented with less and with simpler food, and have less appetite for strong drinks. It is well known that there is far less drunkenness in warm climates, where wine is the common beverage, than in colder climates.

The Italians, notwithstanding that they grow a good deal of cheap wine, are light drinkers compared with Northerners, and are not large eaters. I have observed that a common complaint in all countries where I have traveled is, acidity of the stomach. In fact, I find everywhere it is a fermenting age. Nearly everything is fermented before it is put into the stomach and ferments again after it gets there. Perfect teeth cannot be expected when our bodies are nourished after this abnormal fashion.

I think teeth have degenerated on the continent very much in the last twenty years; caused, no doubt, by the increased indulgence in artificially prepared food and drinks. Over-education, over-work and nervous strain, which are claimed by some to be among the principal causes of decay of the teeth, certainly cannot be applied to the Italians of San Remo, either rich or poor, who neither over-study, over-work nor over-think. The educated Swiss people are both workers and thinkers, but rapid decay of the teeth appears to be just as common among the uneducated peasants of this country as among the former class.

The poor and middle classes in Switzerland know very little about taking care of their teeth, and I doubt that they would spend money enough to have them cared for properly, as they consider this a luxury only for the aristocracy and millionaires. The rich in Switzerland are disposed to spend money on their teeth as soon as they ascertain that they can be preserved by attention. In general on the continent it is only the aristocracy or very rich who take much interest in this branch of science.

The best Swiss dentists are generally very intelligent and well educated men and are as good, if not better, than European dentists in general.

THE GERM THEORY "MORTALLY WOUNDED."

BY C. S. BOYNTON, M. D.

It is a sad thing to be mortally wounded! Dr. Gregg, of Buffalo, claims to have "done the job" for the germ theory of disease. Some of us who for years have thought we could see glimmerings of truth unfolding as each successive discovery was proclaimed and confirmed by subsequent experiment, are not willing to have our names placed on the list of wounded or missing until there is a fair and impartial hearing in the case, and we know for certain whether we have been hit or not. As reported by the papers, his experiment was as follows:

"Dr. Gregg, of Buffalo, has been boiling pure fibrine several hours a day for ten days. He then baked it slowly in an oven three hours; next, burned it black and pulverized it, and finally treated it with absolute alcohol. The powder of this burned mass gave millions of the so-called spherical bacteria or micrococal, thousands of them in a torula form, or chains, and hundreds of 'bacterium termo.' In comparing these forms under an eighth objective with those in blood that have been rotting under warmth three months, they appear identical in every particular. This the doctor regards as the absolute proof of all he has claimed about these forms of so-called bacteria in disease being nothing but granules and pieces of fibrine. The said granules and pieces also show violent motion under the proper conditions, thus suggesting their being polarized and moved by electrical action."

He takes pure fibrine, from what source is not stated, but we presume from fresh drawn blood. Blood freshly drawn from the veins and beaten up while cooling, does not coagulate; the fibrine it contains is *insoluble*, and exists as a *thread-like* coherent mass which, when kneaded for some time in water, becomes finally white and, after drying, resembles muscular fiber. It may be regarded as half-formed flesh. So, for the matter of this experiment, he might as well have taken a bit of beefsteak or leather. This he boiled several hours a day for ten days. Boiling an insoluble substance for ten days would amount to nothing only steralize the liquid in which the substance was contained, and not this, unless the boiling was conducted in a closed chamber. Then baked slowly in an oven for three hours. What for? If it was to be burned at last, what need of this step? Next, it was burned black and pulverized. What have we at this stage of the experiment? Simply animal charcoal—"Only this, and nothing more;" and please bear in mind, charcoal made from a *thread-like*

mass—is it strange that, on viewing this, he should see short rods and round grains in the powder? We can only say, as did the Irishman on viewing Niagara Falls, when his attention was called to the immense volume of water pouring over its rocky dam into the abyss below, "Well, what's to hinder."

To one not versed in the life history of the bacteria, they might be taken for identical forms; but Dr. G. can watch these same "charcoal organisms" till his vertebræ becomes anchylosed and his eye grows dim with age, and never see one of his lively "electrical varmints" reproduce itself by division, or cast off a single spore. It has long ago been decided that the only standard by which the life of these organisms can be proven is the power of reproduction.

We hope to hear from Dr. G. again, and if his charcoal colony should "wax fat and multiply," then the Heterogenesists have made a good point and gained a leader. But as the case now stands, we can only copy the notice of the *Scientific and Literary Gossip*, and leave the Doctor to the mercy of an educated public.

"Dr. R. R. Gregg, of Buffalo, announces in the *Medical Advance* that he has mortally wounded the germ theory of disease. When will the time come when the medical profession will have a scientific education?"

A REVIEW OF PROF. GARRETSON'S ADDRESS.

BY DR. J. L. WILLIAMS, NEW HAVEN, CONN.*

Dr. Williams prefaced his lecture on Embryology by a brief reference to Prof. Garretson's address. He said: "My position, as I stand before you to-night, is not an enviable one. That I should follow, in the same day, with a paper which must necessarily go over at least a portion of the field traversed by one whose life is already laden with the rich fruitage of years, whose reputation is not only national but world-wide, must seem like presumption. To Prof. Garretson, the perfect gentleman, the professional man who probably stands without a rival in his specialty, I accord my most profound respect, with the consciousness that words of mine can hardly add to the high esteem in which he is justly held by his admiring professional brethren. But we must not allow ourselves to be blinded by

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*As Dr. Williams' lecture, which will appear in full and copiously illustrated in the *Cosmos*, was not written as a direct reply to Prof. Garretson, he has prepared at our request this brief review of Prof. Garretson's address.—Ed.

rare personal accomplishments, and my love for truth so far outranks my deference for men, that I say at the outset, frankly, but respectfully, that it has never before been my lot in any dental convention to listen to such a recital of misapprehensions and pseudo-philosophic vagaries as was detailed by the gentleman who addressed you this afternoon upon the subject of Dentition. And this is all the more to be regretted because the position which the gentleman occupies and the manner of his expression seems to put a premium upon a lack of knowledge concerning this most important subject."

Prof. Garretson's statement, in defining his position, that he desired his audience to understand that he proposed to entrench himself in a position from which there could be no possible retreat, or, in other words, that he considered his knowledge upon this subject so nearly infallible that he wished to make no provision for any change of opinion which sometimes grows out of a clearer apprehension arising from newly-acquired facts, was in itself an evidence of weakness and of that intellectual arrogance of which Mrs. Browning says:

> "God laughs in heaven when any man
> Says 'Here I'm learned; this, I understand;
> In that I am never caught at fault or doubt.'"

Prof. Garretson's allusion to the alleged confusion among microscopists, concerning the correct interpretation of what is seen under the microscope, in no way detracts from the force of the fact that no histologist of recognized ability of the present day has ever seen anything remotely resembling his description of the development of a tooth. His total lack of familiarity with the details of microscopic work appears in his use of terms, as when he speaks of photomicrographs as "micro-photographs."

In speaking of the "primitive dental groove," the supposed existence of which was long ago proved a fallacy, he says:

"It is proposed to let the subject evolve for itself demonstration of the existence of a primitive dental groove, seeing that if an adult jaw be taken, and the inter-dental septi be cut away, there is found a big groove; and a big groove implies gradual enlargement of one which at some time must have been so little that no microscope could see it. Mucous membrane does not dip down, it dips up; this difference, as it is trusted the demonstration will show, is greater than that between tweedle-dum and tweedle-dee."

Now I venture the assertion that if these words were to be quoted in the presence of any one engaged in practical embryological inves-

tigation, he would pronounce it ludicrous nonsense. There is expressed an ignorance of the first principles of embryological development, which is almost childlike in its innocence. If any idea is implied, it is the old notion of the complete oak with its roots, branches and leaves existing fully formed, but in miniature, in the acorn. Embryological development does not consist in the gradual *enlargement* of parts which have form in the germ. Organs and parts take form from a mass of embryonal corpuscles according to laws of spiritual type and progressive development. He further says:

"When first seen, a dental germ is microscopic. When seen in that expression which is the meaning of its organic relations, it has surrounded itself with tunica, with dentine, with cementum, and with enamel. Dentine, cementum and enamel are resultant of a common secretion, and this secretion lies with the dental pulp. There is no enamel pulp as propounded, and thought to be shown, by the microscopist."

The statement that the liver secretes bile and gastric juice and saliva, and that cartilage nowhere exists prior to the formation of bone, would be quite as consistent, and have quite as much foundation in fact.

The truth is, the dentinal germ never makes its appearance until after the formation of the enamel pulp or organ; in fact, the beginning of its existence depends upon the presence of this enamel organ. The different stages in the formation of a tooth preceding the appearance of the dentinal germ may be as clearly seen as the capillary circulation in the web of a frog's foot.

The gentleman, in speaking of the continued development of the tooth and surrounding tissues, said:

"Corresponding with the growth of a papilla is that of its alveolar envelope. As such envelope is of sub-mucous nature, being an organization arising out of cells existing between the mucous membrane and plate of jaw, among which cells the germ lies, it is to be recognized that as this increases about the germ it necessarily carries around it a second coat, or tunic; tunica reflexa it is not unwarrantable to call it. This now becomes the dental relation; a germ, originally microscopic, has enlarged until it stands in shape and size the representative of a tooth; this germ is enveloped in a double sac."

This is all purely imaginary, as can be shown by even a cursory examination of actual specimens under the microscope.

Neither a first or a second coat or tunic of mucous membrane ("*tunica propria and tunica reflexa*") ever existed in connection with the development of the teeth ln the manner described, except in

the poetic imagination of Prof. Garretson. I challenge him to produce a single specimen with all of the tissues in their proper position which shows anything resembling this "folding up" of the mucous membrane, as illustrated and described by him. There is neither "folding up" nor "folding down" of mucous membrane in the formation of the tooth-germ. The process by which a tooth is evolved begins in the cuboidal layer of epithelial cells, directly over the position which will be occupied by the future jaw, by a rapid proliferation and increase in size of these cells. This increased activity of the cells at this point slightly elevates the surface layer of cells, producing a noticeable ridge. At the same time, the columnar or lower layer of epithelial cells is pushed downward into the embryonal dermal tissue. These changes occur before the appearance of either the enamel organ or dentinal germ. From the inside of the sheet of columnar cells which has been pushed downward into the jaw there grows out a thin band or lamina (I am speaking now of the inferior maxilla), and from the edge of this band there grow downwards the epithelial *cords*, the enlarged and invaginated ends of which constitute the enamel organ. It is thus seen that there are no such movements of the mucous membrane as those described by Prof. Garretson. Neither is the tooth-germ ever directly enveloped or "encapsuled" by mucous membrane. Soon after the appearance of the dentinal germ, the embryonal corpuscles at its base and sides begin to assume a spindle-shaped form, which is the beginning of the tooth sac. This sac is developed from below upwards until it completely closes in the growing tooth-germ. These processes have been carefully studied from sections of fœtal jaws in the various stages of development. Prof. Andrews, of Cambridge, who has one of the finest collections of microscopic slides illustrating the development of teeth of which I have any knowledge, has been for several years carefully studying this subject. His views are perfectly in harmony with my own, as are those of every practical histologist who has given any considerable time to the study of this subject.

One of the most egregious mistakes which Prof. Garretson makes, and one which can be easily shown to any person who can see anything through a microscope, appears in his conception of enamel formation. He says:

"Accepting the process of tooth development as here exhibited, it becomes understood that enamel has no special pulp as propounded by the histologists. It is also understood that it calcifies from the outside inward, and not from the inside outward."

The enamel pulp is quite as large and *more* conspicuous during the early stages of the development of a tooth than the dentinal pulp. The calcification *does not* proceed from without inward, as any one must know who has ever seen an actual specimen showing the commencement of the formation of enamel and dentine. Calcification begins at the point where the dentinal elements (*odontoblasts*) meet the enamel elements (*ameloblasts*). This line is represented by the position of the hypothetical *membrana præfermation* of Raschkow and the *tunica propria* of Garretson. The first narrow line of enamel which appears lies close to the dentine, the calcification of which begins shortly before that of the enamel. As calcification proceeds, this line (longitudinal section of the tooth-germ showing it as a line) increases in width, the enamel calcifying *outwards* and the dentine *inwards*. This fact alone is sufficient to show the error of Prof. Garretson's theory.

In truth, it is not a question of opinion at all, as Prof. Garretson seeks to show, but one of fact. On his side, it is a presentation of misinterpreted facts, the result of a lack of carefully conducted original investigations. We present actual sections of fœtal jaws illustrating every process which we describe. Prof. Garretson says that he has seen "every possible demonstration that microscope and *micro-photograph* (*?*) can show;" that he has "studied the subject fully fifteen years," and as the results of what most of us would regard as a super-human effort, that of witnessing "every possible demonstration," he has evolved his so-called "philosophic system" of tooth development.

Of course I cannot expect that anything which I may say or show can have any value to one who has considered every possible condition and seen "every possible demonstration," but I do hope that I have said sufficient to convince any one who may be desirous of studying this subject, that it is not safe to follow a "philosophic system" when in search of scientific truth.

Cheeky advertisements are not to be found in America alone; one specimen appears in a small local sheet in Southern Germany: Thousand mark we pay to every one whoever shall get toothache again during (by) the use of, etc., etc. The wording, as the addition in parentheses shows, is ambiguous, and the thousand mark will never be paid.—Tout comme chez nous! Just as at home!

SOCIETIES.

THE TWENTY-NINTH ANNUAL MEETING OF THE AMERICAN DENTAL CONVENTION, HELD AT THE TOWN HALL, SARATOGA SPRINGS, N. Y., AUGUST 14, 15, AND 16, 1883.

(Continued from page 356.)

Paper of Dr. Rynear. (See November number.)

PRESIDENT: I see Dr. Butler, who has had a great experience in these things. I would invite him to give us some of his experience.

Dr. BUTLER: In regard to these metal crowns, I have had some experience in their construction and also in their adjustment, and I appreciate their importance or rather their value. This mode of constructing them is a very great advance over the old method: namely, to raise the whole crown by the old way of impactment of gold. This was a very tedious thing to the operator; patients also appreciate it. I regard this as a better mode, far less laborious all the way round. And if you want to make it stronger by inserting a pin in the pulp canal, you have a stronger thing than by the old mode of raising by the impactment of gold. I am glad that this gentleman has presented the matter here, and I wish that they might be constructed so that we could buy them instead of having to resort to the laboratory and there working them out in the old mode. My mode of doing has been to fit a band and solder on it either platina or gold. This new method does away with all that kind of labor, and if we have two or three sizes, as he suggested, we will be able to fit the caps with very little trouble. One word further in reference to cement fillings: I never have drilled a hole to allow the excess to escape, and I think there is no necessity for it. You recognize that all persons that speak of set crowns will impress upon you the necessity of packing them tight around the neck where the edge goes under the gum. This driving of any band so that it strikes on the alveolar process or comes anywhere near, is a terrible mistake in almost all these cases; you may be sure in all these cases to get recession of the gums, you interfere with the tissues, put something there that is not congenial; I do not believe in such things; I believe it does damage. But if you do not put in too much, and we suppose the operator has a reasonable amount of judgment, or he would not be much of an operator—if you adjust the cap quickly, the small amount escaping is readily removed; and the very fact that you have something that you can drive down gives

you a certainty that the little interstices that you cannot see are filled up; I never made a point for the escape of the excess.

Dr. RYNEAR: I must concur with Dr. Butler that it is not essential, but with persons not familiar with these operations by long practice, it is a prudential way of doing it. I omitted to make the statement that where a portion of the crown remains, it is seldom necessary to put a screw in the root; the least under-cut will retain a crown in position.

Dr. BUTLER: Where I believe this crown of most value is in cases where you may save the pulp, as you would with an ordinary filling.

Dr. PATRICK: I would say that for this metallic crown you must have a community to wear them. Particularly where the funds are limited, as in the South, I could not get a single lady to wear an artificial crown; I saw one lady with the teeth built up of gold very beautifully, but she was so dissatisfied that she had them extracted. I have never found that phosphates could keep a crown in position; phosphates will deteriorate where they come near the gum; I have seen them last one or two years, but never longer. I have seen preparations of gold and platinum made by Dr. Black of California. I was then in Dr. McKellops' office, in St. Louis. A lady came into the office and said: "I do not like the gold to show; my husband objects to it"; he examined the case and could not do better, but he thought he could produce a material that would wear better. He took gold and platina foil, number 40, and filled the tooth with it; at a distance of twenty feet you could hardly distinguish it from the real tooth; he has three numbers—I think numbers 30, 40 and 80. It is so hard that it will cut the hardest file, and the only thing I could suggest to the gentlemen working with crowns is a mixture of that kind.

Dr. RYNEAR: The only material of that kind is manufactured by Wilmer, and I think it is the same; it is very much like platina. These crowns can also be made of platina, and those who desire platina can use them. I must say my individual experience with those crowns dates back over two years. I have used them extensively in my own practice; many are worn, and I never yet had any come back; many are now in the mouth four years, put in the manner I suggested, and they present the appearance as when first put in.

Dr. PATRICK: My experience is in my southern practice. I have never seen phosphates last when coming near the gum; whether this is due to a peculiar condition of the saliva, I cannot say.

Dr. Lovejoy: Every gentleman in the profession will agree with Dr. Patrick that the oxyphosphates do not stand. I would like the experience of Dr. Butler about the Büttner crowns, which I think best for front teeth; but these are driven up with a mallet.

Dr. Rynear: One reason why I was encouraged to make this cap, notwithstanding the fact that Dr. Büttner's presented a very ingenious crown, is the fact that his crown is not universally adapted.

Dr. F. Y. Clark: Did Dr. Rynear state that he put solder inside when they did not fit?

Dr. Rynear: A little solder may be put into the interior preparatory to the removing of a portion, to prevent cutting through the crown while getting the proper occlusion.

Dr. Lovejoy: The principle is the same as that of the Büttner crown; all this is done outside the mouth.

Dr. Patrick: I am much indebted to Dr. Rynear for this crown; it seems to be an advance.

Dr. Rynear: I am very much obliged that you say so. The crowns are stamped from an entire piece of gold; no solder is used. I have found that in molars the circumference of the crown is about equal to the circumference of the neck of the tooth where the root bifurcates, and it will be seldom necessary to make a cut. I have also discovered that the neck of the roots in the front teeth resemble each other, as the crowns resemble one another, and I believe a variety of three of these could be made which would meet all the necessary requisites in this direction. The utility of these crowns consists in the easy manner in which they can be put on; we shape the root as we desire; then we select one of these little caps; it is taken right to the mouth of the patient to its place, and with a burnishing instrument we fit it to the root; the gold is soft, and can be easily shaped; all foreign substance must be removed from the margin of the gum.

Dr. Patrick: I would like to give the information about a gum to attach two pieces of gold or gold and porcelain; the best is six parts of mastic and one of wax; it has no sticking property and holds perfectly tight.

Dr. F. Y. Clark: I can give something in regard to crowns; I have been in the habit of making them for two years. Dr. Rynear has a metallic dye by which the crowns can be stamped beautifully. Instead of applying solder I would take gold amalgam, and you can solder with that very easily, and put on my ring, apply my gold amalgam, and rub so that a perfect amalgamation between the gold and

cap has taken place. When that has hardened, I put the cap in place; you can drive the mercury off by heat, or, if you wish to apply solder, you can do so after driving off the mercury; the cap will hold very firmly; the oxyphosphate will not permeate between that and the tooth. Instead of one crown, I have used two; I fit a rim down over the tooth; it has half the width I intend the crown to have. I then put the cap right over; you have in this way a ring open at the top; you can fill as you please. If you use amalgams, you can pack as you please, and you can see everything perfectly; then you put on the oxyphosphates or whatever you choose, and tell your patient to bring his jaws together; thus you get a perfect antagonism of both jaws. This has been to me the most satisfactory thing; the advantage is that I can look in at the top and see where the imperfections are; then I can put on the top this beautiful crown. It will be quite an advantage if those can be had. Those caps I should think would stick to my rings.

Dr. White: In making these bands I find the easiest way is with a thread of platina. After getting your impression, take a thread of platina and pass it around the tooth and then flow in pure gold, thus giving a band on which you may adapt your porcelain crown on the Richmond plan or any other. I believe the band is better adapted and will give a closer fit than anything; I have put on a number in this way.

Dr. Patrick: You wrap your wire around the root?

Dr. White: Around the impression of the root, flowing pure gold around the platina.

Dr. Rynear: I would rather my crowns would not fit too perfectly; I would rather they should not be tight at the neck.

Dr. White: I would like the objections to a perfect fit; that is just what we seem to be in need of.

Dr. Rynear: I don't mind the perfect fit if you can do it without risk of injuring the cementum of the tooth.

President: We have a gentleman of very large experience among us, Dr. Colidge. He must give us some information.

Dr. Colidge: I simply would say that I have been unable to say or do anything because of slight temporary neuralgic infirmity.

Dr. Lovejoy: Dr. Baker, of Boston, takes a very thin sheet of copper, as thin as possible; he takes next an excavator and runs it around the edge of the gum; then he takes a strip of copper and cuts it three-fourths of an inch wide and bends it around the gum; he bur-

nishes it, ties with white floss silk; then he takes plaster and puts it into the copper cap; lets it set, and after it has set he removes it, and heating it over a spirit lamp puts Babbitt metal into it. Thus you get a cast of the root in Babbitt metal.

Dr. CLARK: I find I can never get a correct impression in the old way.

Dr. LOVEJOY: You get a metallic fit in a few minutes in this way of Dr. Baker.

Dr. BUTLER: I perhaps ought to say a word. Dr. Patrick spoke of the objections to the use of phosphates along the margin of the gum. I recognize that as being true, and have endeavored to overcome the difficulty, and I think I have met with a good degree of success. In setting crowns in this manner, I use a solution of gutta-percha and chloroform instead of oxyphosphate cement; for we all know that the fluids of the mouth do not affect that very much, and it stands for three or four years; there is nothing antagonistic between it and the soft tissues. It seems to be tolerated very kindly.

Afternoon Session, opened at 4 P. M.

Dr. Allen of New York opens the discussion on Pathology and Diagnosis, in which he sets forth the great importance of a careful and correct diagnosis in all cases of pathological conditions we are called upon to treat, many of which are of dark and obscure origin and demand an educated eye and apprehension to fully comprehend.

Dr. CLARK: Anything will be valuable that will throw light on hidden diseases, and I cannot let the paper pass without some discussion.

Prof. MAYR: Not every dentist is a thoroughly educated physician. To him the diagnosis of disease is of less importance than the mere symptomatic treatment of the dental symptoms, but I would like to say a few words about the recklessness with which some dentists talk about scrofula and syphilis. Very many seem to labor under the prejudice—it cannot be called conviction—that scrofula and syphilis have some direct connection. Considering the stain with which all syphilitic diseases are burdened, the stain of unlawful and even criminal sexual intercourse, a dentist cannot be too careful in throwing such a blame upon individuals who may be entirely innocent. *Scrofula has nothing to do whatever with syphilis.* Scrofula is a sluggishness in the transition from the embryonal condition of the tissues to the normal condition; this is very different in hereditary syphilis. We find rather a too quick passage from the embryonal condition to the normal condi-

tion. The teeth of scrofulous persons are invariably well developed as far as the development alone is concerned, but they will not remain so; they are not made up stable enough, and all external influences affect them too quickly; hence, the great frailty of the teeth of scrofulous individuals. Teeth in persons with hereditary syphilis, on the other hand, may be developed imperfectly and with characteristic marks, but they are resistant, and not any more liable to decay than the teeth in other persons. The causes of scrofula are very dark, but the following results have been gathered from very careful statistics, quoted in Niemeyer's pathology: Scrofula in childhood has been found to affect; first, children of the parents who had cancers at the time of generation of the children; second, children of parents who were suffering from advanced tuberculosis; third, children of parents who were suffering from any chronic ailment that affects the entire nutrition of their bodies. Every child generated in the third stage of acquired syphilis in parents is free from syphilis, but may show scrofula. Hence, anything which may produce a weak condition in the bodies of parents is apt to manifest itself in the form of scrofula in children. The period during which parents may transmit syphilis to their children is fortunately very limited, and with judicious treatment may not exceed two years; while the period during which scrofula may be produced in the children is very much longer. This explains the great difference in the number of syphilitic children and of scrofulous children. One will meet with many a practitioner who never had patients suffering with hereditary syphilis, while the number of scrofulous children is almost as great as the number of healthy ones—perfectly in accordance with the frequency of the occurrence of syphilis and weak constitutions in parents. Syphilis is comparatively very rare in America; that is, the real, genuine syphilis. No one, who is a scientifically educated man, will for a moment maintain at present that the common soft chancre has anything to do with syphilis. It is true, it may be unpleasant, it may become gangrenous and destructive, but it is not syphilis. After a person is cured from this benignant and mild affection, he is as well as he was before. It is of hardly more importance than a boil, and not of as much importance as an abscess. Syphilis, on the other hand, begins with the specific induration, having a time of incubation of about three weeks, and it is invariably followed by enlargement of the glands. However free a person may be from plainly visible manifestations of syphilis, the enlarged glands will unmistakably show that he is still infected. The

most characteristic gland in this respect is one of the cervical glands, about two inches behind the ear, which retains its swelling most persistently. Syphilitically swelled glands may be easily distinguished from the glands swollen during the course of scrofula, by the first being hard, painless and only slightly swelled; while the latter generally swell to huge size, are painful, and soon become transformed into abscesses and sores. I think the "duality of syphilis" is now well established; that is, chancre may be one of the varieties of venereal diseases, but it will never show itself in the offspring or in secondary affections. If we consider how easily one word wrongly uttered may ruin a family and do irreparable damage, those dentists who, without very strong proof, ascribe scrofula to syphilis, seem to me more than reckless; it is criminal to say so without strong proof. Your patients do not always know how much a dentist knows or does not know, and the latter had better be careful.

Dr. Clark: One of the most valuable discoveries made with the aid of the microscope has been in the line of the discovery of bacteria in syphilitic lymph. There is no longer any necessity for being in doubt as to the presence of that parasite in the mouth of a syphilitic person. You can examine the serum in the speck and you will find bacterium syphiliticum; it is one of the most valuable discoveries that has been made. This germ has not yet been sufficiently separated from others occurring in the mouth; but when you have once seen it, you will easily recognize it again. Some have contended that it resembles the virus in the rattlesnake, and other writers put it under the head of micrococci; it is also very similar to vaccine virus. With a $\frac{1}{10}$ objective you can very easily see this parasite. You will see a germ you have not seen before, but it requires careful study, and I want to speak very carefully about the matter, otherwise you might take it for another species of the parasites that occur in the mouth.

Dr. Lovejoy: Is the germ seen in the chancre and during the second stage?

Dr. Clark: Only in the second stage of constitutional syphilis.

Dr. Lovejoy: I would like to relate a case, though I suppose most of the gentlemen are familiar with the circumstances. I was doing a piece of work for a young lady, and her sister occupied a seat some distance removed, and while I was filling the tooth she seemed to be troubled with her toe. My patient turned around and said, "Is that toe still troubling you?" "Yes, and I want it cut off." While filling the tooth, I questioned and, by inquiry, found out that the pain was

first in the arm and then in the shoulder. As soon as I had concluded, I requested her to take a seat in the chair. She said she had never had anything done. "I never had toothache. I have about as good teeth as the average, and as I ever want." Her sister finally joining me, she seated herself. I rarely ever saw a finer set of teeth. I could not find a speck of decay. The teeth were regular, and I was about giving up when I noticed that one of the wisdom teeth was missing,—She was 25 or 26 years old. I asked her if she had one extracted; she said no, and I said to her: you have still one to get. I noted a speck in the gum and cut in with the probes, and I never before saw such an effect produced; the wisdom tooth had impacted against the other molar. I heard nothing more of the case for about a week, when her Dr. called and questioned me about the case. It had been under treatment for six months for neuralgic and other troubles. Two weeks after, the sister called on me and told me she had no further pain in her toe. I do not think I have seen any other case where the pain was so far away from the cause of the pain.

Dr. Read: I would like to know if any of the gentlemen have met with a case of deafness caused by the wisdom teeth crowding that way, and producing a continual ringing in the ears for years from exostosis. I had a case which was relieved entirely by drawing the wisdom teeth.

Dr. Allen: I can say, yes sir; I had a case where the eye was considerably affected by it.

Dr. White: I remember a very interesting case bearing on this subject. The patient is now dead, but was very well known. He was an old gentleman, and was suffering very much with his left eye. He was under treatment for a long time, and every remedy seemed to fail. The old gentleman got to be worse and worse; seemed to be failing generally. He was under the treatment of one of the most eminent physicians. The doctor sent him to Saratoga. The old gentleman spent a couple of months here without benefit. He was returning to Savannah, but died on the passage. That was at least reported, but it proved incorrect. He came into my office and was wearing a bandage over the eye with the prospect of losing the sight. He was suffering with necrosis of the lower jaw. I advised the removal of the teeth; they were very loose, and there was a great deal of inflammation around the soft tissue. I thought that had some relation with the disorder in the eye. I removed them. There was excessive pain with the removal of each; they were very sore to

the touch. In probably five or six minutes after the teeth were removed, he said his eye felt better. He remained in my office one half hour and insisted that his eye was better. He called the next day to thank me for removing the teeth, and two weeks after that he could use one eye as well as the other.

Dr. John Allen, of New York, read a paper on Artificial Dentistry, elucidating his well known method of "Continuous Gum Work," which called out considerable discussion of a practical nature.

By vote, a committee of three were appointed to take into consideration the recommendation of President Clark relative to the question of a reorganization or disbandment of the society. The committee were Drs. Fuller of Peekskill, N. Y., Lovejoy of Montreal, and White of Savannah, Ga.

Thursday Morning, August 16.

After relating various incidents of office practice, the report of the committee of three for dissolution is received, and is as follows:

We, as a committee, having been appointed to report upon the advisability of a change in the present organization of the A. D. Convention, having thoroughly investigated the matter, beg leave to report: That the purposes of its organization having apparently been subserved, would respectfully suggest that the same be permanently dissolved. We would also suggest that a committee of five be appointed to take into consideration the advisability of forming a new organization on a more permanent basis, said committee to be elected by the convention.

Samuel A. White.
Geo. W. Lovejoy.
E. D. Fuller.

Dr. Ambler: It may be thought advisable and perhaps expected of me, from my long identification with this organization, and from the interest I have always taken in it since its organization, to say a few words. It has been to me THE organization suitable to the time and condition of the profession. It is entirely different from other organizations which are made up from representatives from local societies. These organizations are closed to the mass of the dental profession, but ours, from its democratic principles, admitting all to its membership, seemed to fill a gap. It was a necessity to those who could not reach organizations heretofore existing and now existing. This organization has done noble work, and I think we may point with pride to many a successful operator and young man who has received

perhaps not his first but his second impulses to investigation, and may have been stirred to exertions in his own behalf from the inspirations he has received from this meeting. Now the local societies have so multiplied in our land, and in all sections of the country, where district societies have been formed to such an extent that they reach all, so that there is hadly any practicing dentist in the country who may not enter one of them. For this reason I think the work of this organization has been completed, and I am ready to vote accordingly that the work is done and that it is well to dissolve the convention. We have now the American Dental Association, which is probably the first in the country. It stands highest, and there are very few dental practitioners but who can at some time, or some day, become a member. The only question presented to my mind is whether it is desirable to make any attempt at reorganization. It strikes me it is not, for the reason that I see no platform on which to stand. The only plan in which we differed from the others was the plan of universal admission. When I speak of universal admission, I mean admission which is surrounded with the safeguards of respectability. I always have been an advocate for the existence of the organization; for years and years I have worked to keep it alive, and you all know my efforts in that direction; they have been appreciated, and I am proud to say that I have been complimented from a number of sources because of my keeping the organization in existence, and it is with some regret that I see it pass out of existence. But when a member ceases to be of use to the body it is better that it be cut off, and therefore I am ready to vote in favor of the report, and shall be very happy to see it adopted.

By unanimous vote, the report is adopted and the convention is declared dissolved; all accounts are squared and the small balance in the treasury is contributed toward the publication of the proceedings.

Adjourned *sine die*.

BROOKLYN DENTAL SOCIETY.

The newly elected officers of the Brooklyn (N. Y.) Dental Society are as follows:

President—Dr. J. N. Race.
Vice-President—Dr. J. B. Brown.
Recording Secretary—Dr. L. G. Wilder.
Corresponding Secretary—Dr. Will. H. Johnston.
Treasurer—Dr. F. C. Walker.
Librarian—Dr. W. M. Ramsdell.

MARYLAND STATE DENTAL ASSOCIATION.

The Maryland State Dental Association was organized at the University of Maryland, October 18, with the following named officers for the ensuing year:

President—Dr. E. I. Smithers.

Vice-President—Dr. T. H. Davy.

Corresponding Secretary—Dr. Wm. A. Mills.

Recording Secretary—Dr. B. M. Hopkinson.

Treasurer—Dr. O. C. McCurdy.

Executive Committee—Drs. B. M. Wilkinson, J. C. Uhler, R. A. Hungerford.

WM. A. MILLS, *Cor. Sec.*

MASSACHUSETTS DENTAL SOCIETY.

The annual meeting of the Mass. Dental Society will be held in Boston on the 13th and 14th of December. An interesting meeting is expected.

EDITORIAL.

CLUBBING RATES.

Every dentist ought to take a *Medical* Journal. Among the *best* is the *New England Medical Monthly*, published by William C. Wile, M. D., Sandy Hook, Ct. Arrangements have been completed so that those of our subscribers who wish can have the NEW ENGLAND JOURNAL OF DENTISTRY and the *New England Medical Monthly*, for one year, by forwarding to us $3.00. The price per annum, for each journal, is $2.00. To secure the advantage of these clubbing rates, the $3.00 *must* accompany the order.

ELECTRIC GOLD FOIL.

A subscriber sends us the following:

The new Electric Gold Foil is a marvel of softness and cohesiveness. We believe that it is by far the finest working cohesive foil that has ever been offered to the profession. It is for sale by R. S. Williams.

"WHAT DIFFERENCE DOES IT MAKE TO ME WHETHER IT DIPS DOWN OR DIPS UP?"

A dentist who had attended the meeting of the New England Dental Society in Providence, and heard the papers of Prof. Garretson and Dr. Williams, together with the discussions thereon by Drs. Atkinson and Andrews, asked the question which heads this article, and added, that it made not the slightest difference to him which of the theories were true. "Either way, it would not help him to fill a tooth or assist him to properly construct a denture." His remarks furnish an excellent text for a short homily on the too prevalent tendency among dentists to treat with indifference or contempt any papers or discussions in societies or dental journals, wherein the connection between the essay and discussions, and their ability to earn increased fees, as a result of reading or listening, is not very apparent.

A search for truth, pure and simple, has no charm for some minds. Whether "bug" or "drug" be the chief factor in dental caries, many dentists care not. They deem it their sole business to remedy, for a fee, the effects of disease—not to study its etiology or to prevent it. Truths which are so obscure as only to be revealed by microscopic search, they deem of microscopic value. They seem forgetful of the fact that all the laws of matter which they do recognize, and in harmony with which they daily range themselves, and without the recognition and understanding of which they could not perform effectively the simplest operation, have been discovered by closely observing facts which, to the ordinary observer, were too obscure to attract attention. Failing to apply to these facts deductive reasoning, they see little use in histology and "fine spun theorizing" over phenomena which can only be discovered by the use of an immersion lens.

The "practical man," as some delight to call themselves, can see no use in studying the development and orderly growth of a tooth encased within bony walls because, he says, "I can't gain access to it to direct or control it if it is going wrong. I must even remain in ignorance as to whether it is going wrong or not until all is over, and the perfect or imperfect result is 'erupted;' whereas, I may go into my garden and direct the growth of my developing plants and vines. I can prune here, and support there. I can supply or withhold nourishment, as the case may seem to demand. By chemical analyses of plant and soil, I can even discover just what food is needed at different periods of the plant's growth. This I can supply, and my study, observation and research take tangible form and possess appreciable value at harvest time. Tell me how to fill a tooth more perfectly,

expeditiously, or economically, and I will be glad to listen to you. But," says the "practical man," "I take but 'little stock' in microscopy and histology."

Nothing is truer than the familiar aphorism, "Knowledge is power." And there is no knowledge but may be of use and confer power on its possessor.

The present status of anatomy and physiology, which is of such incalculable benefit to mankind, is the result of toilsome, patient and, to the "practical man," dull and tedious research. Gray and Carpenter, and others in the same field, have learned many things which possibly possess no very clearly defined commercial or practical value. But "who can tell whether shall prosper, this or that?"

> "Had we but a searching mind,
> Seeking truth where'er it springs,
> We should then true uses find
> Hidden in familiar things."

The dentist who takes no interest in investigating the order of development and the chemical make-up of the tissues upon which he daily operates, is very likely to be an intellectually lazy man, with all which that implies. He is likely to show a strong preference for acquiring what he does learn by the same methods the parrot learns his lessons. What he learns in this way is likely to have as little meaning for him as has the parrot's lesson for it. We all know that truths, or methods of our own discovering or unfolding, serve us the most faithfully and effectively, and remain to serve us long after the borrowed help has left our employ. No one can thoroughly familiarize himself with anything relating, even indirectly, to his chosen vocation without growing broader, more confident, and in every way better fitted for his hum-drum every day duties, or for an emergency. On the other hand, let a dentist neglect study, take no interest in searching out truths, simply because he conceives they have no commercial value, and he becomes narrow, soon finds himself moving in ruts, is unprogressive, and is pretty sure to "get left" in the race for a good class of patronage. The difference in the condition of the man who digs on our streets and the man who rides over them in comfortable equipage, is for the most part traceable to the difference in their intelligence. The first will labor, but is too indolent to think or, it may be, is incapable of sustained thought; the other has been a persistent student, it may be, in his lone room after a hard day's toil. Never mind. It has left its imprint on his brow, and marked every

lineament of his countenance. He possesses power because "Knowledge is power." If he is a physician, his services are sought for far and near; if a dentist, his practice is likely to be limited only by his ability to meet the demands upon his time.

Intellectual indolence is the barrier that obstructs the path to many a would-be dentist's success. The relation between histology, microscopy, etiology, chemistry, and kindred subjects connected with a dentist's calling, and his success, is the relation of fitness, adaptedness; and though the relation may be less direct and apparent than between some other studies and successful dentistry, yet rest assured that it is none the less real. No study can be intelligently pursued without breadth, mastery and fitness being the resultants. Let whosoever will, sow. Intelligence will be sure in the long run to reap the harvest.

DENTAL LEGISLATION IN CANADA.

We are indebted to Dr. W. Geo. Beers, of Montreal, for a copy of the *Montreal Daily Witness*, containing the following interesting history of dental legislation in the Provinces. Dr. Beers is made president of the Board of Examiners by recent election.

THE DENTISTS' MEETING.

Exactly fifteen years ago a number of dentists of Montreal, Quebec and Sherbrooke met at the office of Dr. Chas. Brewster, and organized the "Dental Association of the Province of Quebec;" and subsequently obtained an act of incorporation by unanimous desire of the profession. A Board of Examiners was elected, and the first start made toward systematizing the educational requirements of future practitioners. The act, unfortunately, was defective, and, notwithstanding several amendments, the Board was kept in litigation, and constant attempts were made to frustrate efforts to suppress the quackery which had grown up beside regular practice. In spite of this, the progress was very marked; a dental journal—the only one in Canada—was established, a voluntary Provincial Association, and the Montreal Dental Society, all of which were actively sustained. The defects in the Act continued to be a source of discouragement to the large majority of members, and of much trouble and expense to the few, and the success of opposition from unlicensed parties had no small share in disturbing the associative efforts. The Board, however, continued its work from year to year in a very unobtrusive way, and notwithstanding the difficulties peculiar to this Province, and which do not exist elsewhere, has done good service for the public and the profession. It may not be amiss here to say that the unremunerative character of the profession impelling almost every man in it

to seek outside sources of income, has increased year by year, and that while every other profession has its high compensations, dentistry remains the most taxing and unhealthy as well as the poorest paid of all. This grievance has become a serious one.

Last March the act of incorporation was again amended, and while valuable additions were secured, some unasked for clauses were inserted which have aroused much indignation in the profession. For instance, dentists who have had ten years' practice are entitled to exemption from the matriculation examination, should they desire to study and practice medicine. No such amendment was asked for or even thought of by the Association or the Board, and no such humiliation of the profession would be tolerated. The meeting on Wednesday, unanimously by resolution, repudiated the responsibility of the clause, and not only expressed strong disapproval of its unauthorized insertion in a thoughtless way, by a member in Quebec, but decided to petition the Legislature for its removal, as an unsolicited encroachment upon the Medical Bill.

Another specimen of individual tampering with the act, was found in the removal of two words in a clause, which was intended to prevent parties under civil interdict from practicing during the existence of the interdict. For instance, an unlicensed practitioner has been under a judicial interdict for several years, was previously rejected by the Board of Examiners upon examination on account of gross ignorance, which action was sustained by the Superior Court, and in appeal this subsequent application for a private bill was twice rejected by the Local Legislature, and upon several occasions he was prosecuted by patients for malpractcie, and paid damages in some cases. He afterwards issued a card with the following suggestive announcement: "No responsibility in extracting teeth or injuries accidentally inflicted in mouth." The interdict, which still exists, declares that he is "incapable of attending to business, not having the necessary intelligence," and that he is weak of mind, incapable to work alone, etc. It may surprise your readers to learn that this party was the means of again obstructing the wishes of the Association, and an unlicensed practitioner caused the removal of words which applied to persons nnder civil interdict, and obtained a special clause in the Dentists' Bill to give him legal right to practice in the face of his rejection by the Board of Examiners, by the Superior Court and Court of Appeals, and by the very Local Legislature which inconsistently gave him a privilege it twice before denied him. The special influence brought to bear in this case against the interest of the profession, and the public whom the Dental Board is constituted to protect, deserves publicity. The act was pushed through without the promised notice having been given to the secretary. It is a very humiliating reflection, that illegal practitioners by this clause, have had conferred upon them exceptional privileges denied to regular students and dentists. Doubtless, like many acts, its special applications were unknown to the majority of the members of the House.

PROF. GARRETSON ON PHILOSOPHY.

We quote the following from the *Philadelphia Press*, of Oct. 31st, which will explain itself. We are also glad to know that these lectures are drawing such crowds as to leave scarcely "breathing room" in the hall. We are not, however, surprised at this; should indeed be more surprised if it were otherwise. If space could be obliterated by a wish, we should be there, but this is one of the seemingly unfortunate limitations of *present* time.

The first of a series of philosophical lectures on the "Nature of Things" was delivered last night by Dr. J. E. Garretson, at the Hospital of Oral Surgery. The lecturer succeeded so thoroughly in presenting his views in such simple language; in making rich, happy similes; in impressing his ideas with such vigor that the usually dry subject of philosophy was invested with an interest seldom attendant upon such an address. Dr. Garretson was careful to say in the first few opening sentences that it was positively requisite that his hearers should follow him through the series in order to have a connected chain of ideas. He said:

"I may otherwise be denounced as a rank Atheist. Understand that we start at the point of simplicity—the prayer at the mother's knee. We travel around in a circle. Should you leave me when I have completed one quarter of the journey, you leave me a materialist; half way around, you become a Pantheist; three quarters, a Methodist. But continue with me, and we will return to the point from whence we started. I can give no better idea of what I intend to present than by quoting from one of the Platonic dialogues: One Hippocrates, a young man of family and of parts, desirous of becoming a citizen of note, went, accompanied by Socrates, to place himself under Protagoras as a teacher. 'What,' asked Socrates of Protagoras, 'do you propose to teach my beardless friend?' Turning to the youth, Protagoras replied: 'Young man, the advantage you will derive from associating with me is this: On the first day of your being with me you will return home a better man; on the second day, you will return home a still better man; and on each succeeding day you will become better.' I hope," said the lecturer, turning and pointing to the blackboard on which was written the words, "*In nomine domine*," "that when these lectures are concluded, you may, each and all of you, be able to live out the philosophy which I will try to teach."

A PRACTICAL ITEM.

We have not always found it easy to punch a hole in our rubber dam in just the right place. Particularly was this the case when we used to cut the hole with a knife, while the rubber was stretched over the end of an excavator. Not only did we not always succeed in getting the hole in the right place, but it was not, and could not be, by this uncertain method, always cut the right size. We have tried different punches, but consider Ainsworth's as near perfection as we are likely to obtain; and to assist us in *knowing* just where the holes should be cut, we have constructed a guide in this simple man-

ner: Take a piece of black walnut board (or of any other wood), three-fourths of an inch thick, outline on this a horse-shoe shaped piece, a little larger than a set of teeth, and cut it out. Lay on this a full denture of average size and shape, and mark where the center of each tooth comes. Now take some wire (Stubbs' No. 50 is good), size not essential, so it be stiff enough, cut into pieces about an inch long and point one end and square the other; drive these pins into the block where you have marked the center of the teeth. The ends of the pins should all be left on a level, which can readily be done by careful driving, and finally leveling up by rubbing over emery cloth or paper, laid on a smooth level surface. To use, lay the rubber to be punched on a table, or anywhere where it will lie smoothly. Dip the pins in water (letting them just touch the surface is sufficient), and a tiny drop will cling to the end of each pin. Set the pins on to your rubber, remove, and a moist dot appears for each tooth. Make your selection, and in cutting the hole, vary the position if you judge it necessary. This will be found an excellent guide many times, and it can be made almost in the time it has taken to write this item.

Prof. C. A. Brackett of Harvard, read a paper on "Mistakes and Failures" at a meeting of the New York Odontological Society, on the evening of Nov. 20. Before the paper was read, he exhibited a tooth (third inferior molar) which had in it a large corono-buccal cavity. About twenty-five years ago, the late Dr. Tucker, of Boston, told the patient, whose tooth it was, that it was either impossible or inexpedient to fill it. The late Dr. Bemis, being consulted, filled the buccal portion of the cavity with a composition of gutta-percha, and the coronal portion with gold—a gold band which had previously been fitted very accurately around the crown serving at once for a matrix and retainer of the gold plug.

About a year ago Dr. Brackett was consulted, and he filled a cavity that had formed at the neck with red gutta-percha, but the crown of the tooth subsequently broke off, and the root, which was loose, was removed. The specimen was very interesting, both as a sample of ingenious skill, and of the wonderful conservative qualities of gutta-percha when used for dental fillings.

By reading the papers of Drs. Garretson and Williams, to be found in this number, the interesting "points of difference" — to which we alluded in the November number in our item relative to the Providence meeting—may be clearly understood.

PUBLISHER'S NOTICE.

THE JOURNAL FOR 1884.

We would ask special attention to the *prospectus* of *Volume III.*, to be found elsewhere in this number. It embodies the aims and purposes of this journal for 1884. We feel confident that a large measure of these objects will be secured. Shall we have *your co-operation?* We propose no special pleadings for *renewals* or *new subscribers.* It is for each one to decide for himself whether he wants such a journal or no. The steady and unabating growth of our subscription list from the day our first number was issued until the present time, together with the surprisingly large number of encouraging letters and words of good cheer that have come unsolicited to us of late from very prominent men, lead us to believe that such a journal is appreciated by the profession. We shall continue our efforts to meet this manifest want, and with increased facilities and the efficient editorial aid of the gentlemen whose names are attached to the prospectus, we believe that every dentist will find it advantageous to see to it that his name appears on our subscription books. We send out a large number this month to non-subscribers. If such wish to see more of us and know us better, they will find a "blank" following the second page of the cover, which will be a convenient way for them to indicate such a wish.

We especially request that secretaries of societies will co-operate with us in giving to the profession whatever may be of general interest that occurs in their respective associations, thus helping to make the JOURNAL of essential value to every dentist. We shall be glad to correspond with the secretary of any society with reference to matters of mutual interest.

Arrangements are being made to secure monthly communications from foreign countries, and translations of all that is of special value in foreign dental publications. One of our associate editors, who has an extensive acquaintance with prominent men in these countries, will give special attention to this department.

Our circulation now extends all over the United States, into Canada, England, France, Germany, Italy and South America—a fact of importance to advertisers, to whom we shall be glad to offer space and rates.

THE JOURNAL CO.

DR. GREGG'S EXPERIMENTS.

One of our contributors has treated experiments of Dr. Gregg, of Buffalo, rather too carefully. The experiments have, as far as reported, a great number of stages where germs may be smuggled in. The fibrine mass is burned, but probably not completely; albumen is very resistant and contains within the charred cover for a long time only browned substance. Unless Dr. Gregg uses more than a Huxley's skill and care during the pulverizing process, "floating matter in the air" will fall in; and, as is well known, subsequent treatment with absolute alcohol only retards their development. As soon as the alcohol has evaporated they are again active, and in an imperfectly carbonized mass, nay, even in a carbonized mass, which contains all the salts of fibrine, they will grow on the ammonia of the air, etc. The experiments of Dr. Gregg seem hardly worth discussing, although a newspaper extract may not cover all. Is Dr. Gregg one of those men whom the laurels of others will deprive of sleep, or is he a careful student? We can hardly give an unbiased opinion without the full report of the experiments.

BOOKS AND PAMPHLETS.

DIFFICULT DENTITION, REFLEX ACTIONS AND THE USE OF THE GUM LANCET. By J. Morgan Howe, M. D., M. D. S., 34 West 35th street, New York. A reprint from the *Independent Practitioner* for November, 1883.

This is a thoroughly scientific and conservative paper on the above subject and worthy the study of every dentist and physician. In this paper the Doctor offers "some facts and suggestions as reasons for believing that the deductions of so many, reached by clinical experience, that dentition is a cause of nervous irritation and numerous reflex disturbances, is not a mistaken one." In taking this position, however, he recognizes the fact that this *extreme* view "has come to be so commonly accepted that it is quite probable that the origin of many" infantile ailments or "disturbances has often been falsely attributed to teething, as it furnished a sufficient scape-goat for indolence and ignorance." As between this view and that of some other writers, namely, that dentition is a normal physiological process, therefore it is absurd to claim it as being dangerous, or capable of producing fatal results, the author takes middle ground. While denying

that the disturbances common to infantile life are, to the extent very commonly accredited, due to "teething," it is nevertheless an important factor in producing them. He says: "The irritation so frequently produced by first dentition begins, as we have endeavored to show, at an early period, and may cause serious reflex disturbances at any time thereafter. The emesis, diarrhœa, and convulsions of this period, are of course liable to be produced by other causes, but the clinical experiences of numerous competent practitioners have been amply sufficient to confirm the old opinion, that these phenomena are often due to dental irritation, so that the conclusion will hardly be disturbed by argument based on the fact that dentition is a physiological process."

He refers briefly to diagnosis and, more at length, to treatment, which seem to us clear, concise and sensible, regarding as it does systemic treatment and the use of the lancet. Every one should read the paper.

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